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THE WELDING ENGINEER

APRIL, 1953

A McGRAW-HILL PUBLICATION

NEW

QUALITY JACKSON PRODUCTS

This new holder should be your choice for welding jobs in the 250-amp range . . . a holder light as possible, yet rugged enough to withstand unavoidable rough usage.

The same heat treated 98% copper alloy that made Jackson's larger holders come out on top when tested for strength, hardness and conductivity is used in this model.

We rate its capacity at 250 amps, recommend it for electrodes 1/16 through 7/32 inch. Cables, no larger than No. 1/0, may be soldered or brazed, and cables through No. 1 may be clamped in place.

Built along the lines of Jackson's Featherlight Model AW (most parts are identical), it fits like a glove, is easy to operate.

ANOTHER FIRST! Newly developed thermal-setting material for Jackson jaw insulators represents the latest advance in greater impact strength at the holder's most vulnerable points.

PRICE $5.00 lower in quantity

JACKSON HOLDER MODEL AW-C

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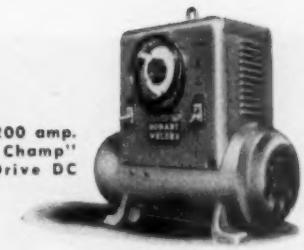
HOBART ARC WELDERS

TROY, OHIO • "ONE OF THE WORLD'S LARGEST MANUFACTURERS OF ARC WELDERS" • BOX U-43



HOBART 200 amp. "Bantam Champ" Electric Drive DC Welder

HOBART 300 amp. Portable Electric Drive DC Welder

HOBART 300 amp. Gas Engine Drive DC Welder

There's only ONE foolproof way to select a welder...

. . . and that's by comparing one machine point-for-point against all others on the market. It's scientific . . . it's cold-blooded . . . but it's the only sure way.

We invite you to make such a comparison with a Hobart Welder. We want you to see for yourself, firsthand, why a Hobart with its advanced engineering and rugged, heavy duty construction is best able to offer you the lower costs and constant performance so essential to profitable production welding—to understand why Hobart has long been the favorite of the country's leading welding operators.

Such a comparison is all the proof you'll need. Why not make it now? Mail coupon today for complete information.

It's easier to weld it right with HOBART ELECTRODES

Whatever your particular welding problem may be, it will pay you to investigate Hobart Electrodes. Made in a full range of types and sizes, they assure you better, faster, lower cost welds on all types of work. Check coupon today for full details.

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☐ Electric Drive Welder ☐ Gas Drive Welder ☐ Pipeliner Welder ☐ Bantam Champ Welder. Send me ☐ Welder Catalog ☐ Electrode Catalog ☐ Accessory Catalog.

FREE

☐ "HOW TO GET BETTER WELDS." Valuable new vest pocket booklet.

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3000 Stock Items Made by Corrosion-Resistant Specialists

FLOWLINE Welding Fittings are handled throughout the country by leading distributors who sell everything for corrosion-resistant piping —fittings, valves, pipe, and accessories. This phase of our specialization in corrosion-resistant fittings helps users obtain "on-the-job" service — and take fullest advantage of the economy and efficiency of simplified welded construction.

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FLOWLINE corrosion-resistant fittings include tees, stub ends, ells, reducers, and caps. All are made of close-grained forged or wrought metals, cold formed by our exclusive process and annealed, which consistently puts the metal in the best condition for corrosion service. These fittings are normally stocked at strategic points in Schedules 10, 40, and 80 (Schedule 5 also available)—sizes ½" through 12" — in stainless steel Types 304, 316, 347; Monel; Nickel.

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NEW CASTLE, PENNSYLVANIA

World's Largest Manufacturer of Stainless Welding Fittings

THE WELDING ENGINEER

A McGRAW-HILL PUBLICATION

Member of Associated Business Publications and Audit Bureau of Circulations

VOLUME 38 NUMBER 4

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APRIL, 1953

Cover: *In the tube: Julius Kozlowski, of General Electric X-Ray Department, Milwaukee, is engaged in spot welding the strips of silicon steel that form the primary winding of a 2,000,000-volt X-ray transformer. Such powerful X-ray units are used for the inspection of welds in pressure vessels and also in the treatment of deep-seated cancers.*

FABRICATION

Underframes—A Job for Automatic Welding and Cutting **39**
Fred M. Burt

X-Ray Welds for Aluminum Tanks **64**
Jerome Hertel

DESIGN

No Drawings . . . They Just Grew! **42**

MAINTENANCE

Braze Welding on Big Repair Jobs **44**
Herman C. Phelps

OPERATION

What You Need to Know to Weld High-Alloy Castings—I **48**
Earl M. Anger, William E. Dundon, Garth Thompson

Rear View Welding Mirror **47**
Thomas Trail

PRODUCTION

Brazing as a Production Medium—II **53**
Lester F. Spencer

What Kind of Welding Is It? **62**

RESEARCH

Here's How to Make Ductile Welds in Zirconium **58**
F. G. Cox

DEPARTMENTS

News 5
Welding Info-Aids 33
Editorial: Mig and Tig Welding 37
Data Sheet No. 151: Minimum Physical Properties for RWMA Alloys 67
On the Job 70
New Products 74
People 99
30 Years Ago 103
Patents 104
Searchlight Section 107
Where to Buy 107
Advertisers in This Issue 108

FOR YOUR SPECIAL WELDING PROBLEMS

Standard stock cold forged electrodes

We could fill the page . . . and several more . . . with different shapes of cold formed electrodes that Mallory carries in stock for immediate shipment.

For special and irregular applications, these cold forged, gun-type electrodes give you all the advantages of full hard, standard rod stock electrodes. Compared to cast or forged electrodes they have better physical and mechanical properties. They mushroom less . . . giving you more uniform welds with less down time for dressing. They give you a greater variety of angles and nose shapes to choose from.

Mallory has made a specialty of adapting standard welding items for special applications. The electrodes shown here are just a few of the special shapes we carry in stock that may fit your particular job. When that next special welding application comes along, send us a sketch of your requirements. We may be able to supply you from stock. A wide range of tools and fixtures on hand enables Mallory to produce the shape you want, quickly and without the expense of special tooling.

You can always depend on outstanding performance and engineering service when you call Mallory for electrodes . . . holders . . . rods and bars . . . castings . . . dies . . . and forgings.

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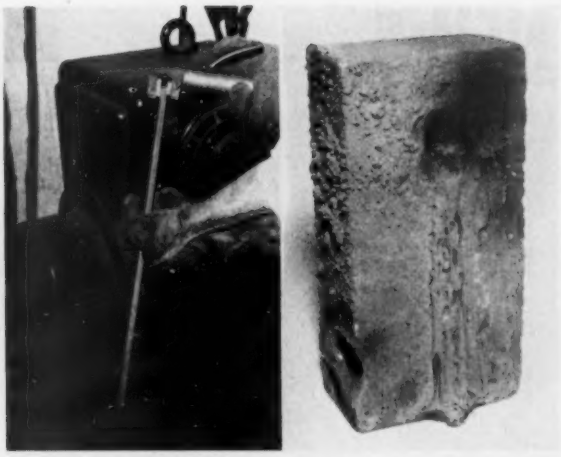
For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

NEW X-RAY head wins Mill and Factory "new product of the month" award for General Electric's X-Ray Dept.



ARC-PIERCING firebrick, granite, mica or tungsten is easy for twin electrode "DynArc" cutting process

NEWS

Suggest CMP Amendment for More Stainless

NPA has been asked to amend CMP to allow steel producers to accept unrated orders for nickel-bearing stainless steel. These would be for shipment through June and also to the extent that mill space is available at commencement of lead time. The recommendation was made by the Stainless Steel Industry Advisory Committee.

Approving a formal report on the subject of decontrol, the committee said consumers should be permitted to use nickel-bearing stainless in addition to quantities alloted for authorized schedules.

It was also recommended that NPA eliminate the rule requiring filing and approval of monthly melting schedules for all stainless steels. Committee members say continuance of the melting schedule system of control is unnecessary. The system has been in use since mid-1951 as a means of conserving scarce alloying materials.

Starting with the third quarter of 1953, the committee recommended that these steps be taken to assure fulfillment of military and AEC requirements for nickel-bearing stainless: 1) Continue nickel allocation banding for orders bearing symbols A, B, C or E and a digit, including the program identification B-5 (components). The use of the B-5 symbol to obtain stainless steel mill products should be authorized for manufacturers of Class B products to obtain materials required to fill production schedules.

* * *

General Electric X-Ray Wins Magazine Award

left photo

EDITORS of *Mill and Factory* magazine have awarded the X-Ray Dept., General Electric Co., Milwaukee, a special plaque for the "new product of the month" in January. Called the "Resotron 250," it is a lightweight industrial X-ray machine for easy, portable inspecting of welds in pressure vessels, ships and buildings. It weighs less than half and is only one-eighth the size of conventional 250,000 volt machines.

Shown above, left to right, are A. L. Pace, industrial products section, G-E X-Ray Dept.; Woodrow Hansen, project engineer, receiving the award on behalf of his co-workers; Leonard Fons; Jerry Kozlow, Carl Harrington, managing editor of *Mill and Factory*, and E. W. Robb, Midwest manager for the magazine.

* * *

Arc Cutting Process Drills Hole in Firebrick

right photo

A NEW process called "DynArc" is claimed to develop an electric arc hot enough to melt firebrick, stone, concrete and even asbestos board. It employs a coated twin electrode and a special electrode holder connected to a standard welding generator.

According to the manufacturer, Eutectic Welding Alloys Corp., 172nd St. and Northern Blvd., Flushing, N.Y., anyone owning a standard welder will now be able to drill holes in metallic and non-metallic refractory materials easily and quickly. Its possibilities in civilian defense and disaster situations, where brick and rubble must be cleared quickly, are manifold. An example of the speed of the "DynArc" process is afforded by a test in which a 1-in. diameter hole was burned through a firebrick in less than a minute (above photo).

Houston Forecast

More than 90% of the exhibit space for the AWS-sponsored Welding Industry Exposition, June 16-19, at Houston, Texas, had been sold at the present writing. The number of welding and allied equipment exhibitors reserving space in the Shamrock Hall of Exhibits is already twice that for any previous show.

A total of 36 technical papers will be presented from Tuesday through Friday in meeting rooms of the air-conditioned Shamrock Hotel. There will be technical sessions all day Tuesday and Wednesday and on Thursday and Friday mornings.

Our prediction: one of the outstanding papers will be "Recrystallization Welding" prepared by Dr. John Parks, Armour Research Foundation, on pressure welding of aluminum. Other papers will be given on titanium and improvements in automatic welding.

NEWS

from page 5

Photo by Bill Hutton

WEST COAST Square D men recently met with welder control specialists from Los Angeles and San Francisco

Photo courtesy A. M. Byers Co.

WROUGHT IRON steam line of 2½-in. diameter is welded on Budd streamlined car for Burlington railroad

Welding Control Seminars Held By Square D at L. A.

SPECIAL instruction and trouble-shooting sessions on electronic controls for welders were presented on the West coast recently by Square D Co. representatives. The series of seminars was attended by automotive and aircraft personnel from San Diego, Los Angeles and San Francisco as well as other users of industrial electronic equipment on the Pacific coast.

Shown in the photo above beside a resistance welder control are J. W. Brown, supervisor, resistance welder control sales, Square D Co., Milwaukee; F. Kowalewski, Aircraft Engineering & Maintenance Co., Oakland, Calif.; D. H. Miller, industrial control sales manager of Square D's western division; J. H. Amann, branch manager of Square D's San Francisco office; R. Balloue, Aircraft Engineering and Maintenance Co.; and R. Pierce, W. R. Ames Co., San Francisco.

* * *

Final IAA Plans Set for Atlanta, April 13-15

LUNCHEONS and technical meetings of the International Acetylene Association will take place at the Biltmore Hotel, Atlanta, Ga., on April 13 to 15. Presentation of the Morehead Medal will be made at the opening luncheon. A technical session on maintenance will be held Monday afternoon after the opening luncheon. On Tuesday, "Flames for Profit" will be the theme of the morning meeting. A chemical and metallurgical session, including a paper on "Calcium Carbide in the Cupola," will follow lunch. These meetings, as well as the luncheon, are open to the public.

The 1953 annual business meeting and closed industry session will be held Wednesday morning, April 15. That afternoon, IAA members will view a demonstration of flame-piercing at a quarry in the Atlanta area.

* * *

Brass Mill Producers Ask Removal of Controls

DISCONTINUANCE of government controls on prices of primary copper and brass mill products, as well as removal of all controls on copper raw materials allocation, was recommended early in March by the Brass Mill Industry Advisory Committee at an NPA meeting.

Unanimously, the committee asked that such prices be decontrolled immediately or production will be further drastically curtailed.

Committee members said increased costs and the recent action decontrolling the price of non-ferrous scrap, (affecting 34% of the industry's raw materials) has resulted in chaotic conditions.

Contrary to government expectations, removal of price controls on scrap has not brought "scrap out into the market." Sellers of scrap have been persistent in holding on to their stocks in the hope of getting higher prices when primary copper price ceilings are removed.

Industry representatives said that: 1) Lack of scrap could shut down brass mill operations. 2) The situation was serious and needed immediate action. 3) The removal of price controls on non-ferrous scrap should have been accompanied by similar actions on primary copper and brass mill products.

Removal of allocation controls was advised by a majority of the committee at the same time.

However, one committeeman said small mills were fearful they wouldn't get their supply of refined copper from primary producers if allocation controls were removed. He mentioned that large users might be in an advantageous position if the demand exceeded the supply.

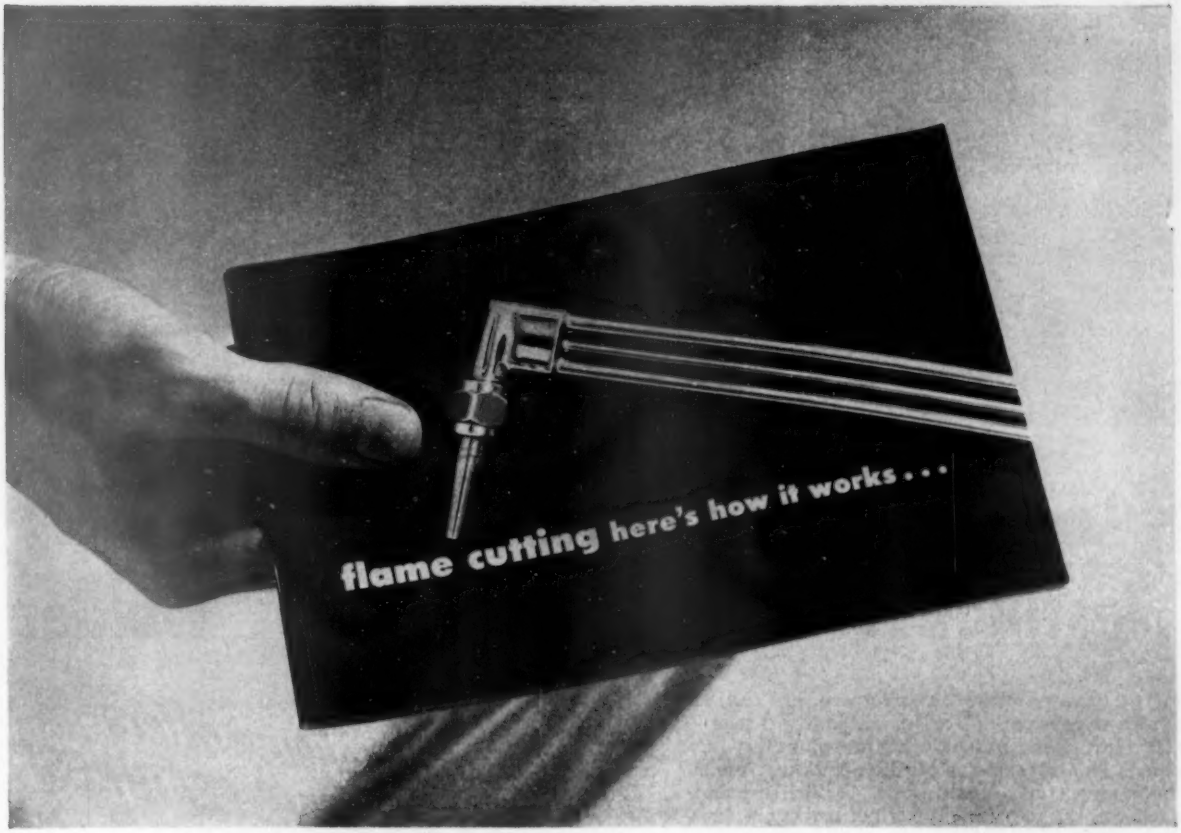
The committee also recommended that the Brass Mill Industry Advisory Committee be kept intact on a stand-by basis, even though allocation controls should be completely removed.

* * *

Tank Program Stretched But Not Cut

The Army tank program has not been curtailed or cut back as was predicted in THE WELDING ENGINEER for March. A newer program has been instituted which calls for a stretchout of production over a longer period. The number of tanks will be basically about the same. Cancelled orders for materials used in their construction will be replaced in the near future. Advantage of the new program is its considerable reduction of inventory which is expected to somewhat relieve shortages of many materials, one of which is stainless steel electrodes.

(More News on page 76)



this is a really good book, you will want a copy of it . . . free, while supply lasts

This forty page brochure is packed full of important, interesting and worth-while information; 27 fine photographs illustrate the well written text. Here are some of the subjects covered:

What is flame cutting . . . why preheating flames . . . one or many preheating flames . . . how important is the oxygen jet . . . how much oxygen pressure do we need . . . does pressure dictate volume . . . which fuel gas to select . . . and full details about how a cutting torch is designed and how it functions.

There are hints on how to select a cutting tip . . . and much added data of value to the experienced operator as well as for the rankest beginner. It's a good book and you will want to own a copy of it. Write today for YOUR FREE COPY.

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925

Made by National SINCE 1910 WELDING EQUIPMENT CO., San Francisco 5, California

Look what you can do with the New Westinghouse Engine-Driven D-C Welder

Here is a lightweight, 200-ampere, gas engine-driven welder with up to 3-kw stand-by power—all in the same unit. By simply plugging into convenient receptacles on the a-c power panel, the operator may obtain power for drills, grinders, pumps, lights and other electrical equipment.

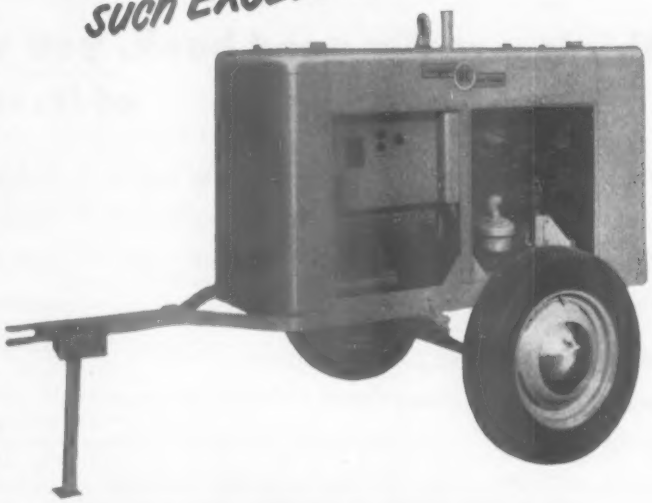
LIGHT—The auxiliary generator power in this machine is gained at no penalty in weight. The 1,150 pounds represent the lightest possible engine-driven welder with stand-by power that you can buy today. The welder is rated at 200 amperes, full 60-percent duty cycle, NEMA rated, with a maximum of 250 amperes.

COMPACT—This self-contained unit is only 39½ inches from the base plane to the top of the lifting eye. Its over-all length is 62⅜ inches. The welding generator is self-excited and close coupled to the driving engine.

VERSATILE—This welder is valuable in construction and maintenance operations on gas and petroleum pipelines, road-building projects, railroads—in fact at any remote site where there is no access to ordinary power supply. In disaster areas, this welder can power vital electrical equipment until normal service has been restored. The standard unit is skid mounted for truck transport or may be mounted on a high-speed, pneumatic-tired trailer.

For more information contact your nearest Westinghouse representative, or write to the Westinghouse Electric Corporation, Welding Division, P. O. Box 868, Pittsburgh 30, Penna. Ask for Booklet B-5455. J-21710-B

Only Westinghouse offers such EXCLUSIVE FEATURES!



YOU CAN BE SURE...IF IT'S Westinghouse

WELDING EQUIPMENT

REXWELD extends SERVICE LIFE of Hartig extruder feed screws by 400%

Here is a typical case of how REXWELD Hard Surfacing Rods are used to extend tool and product life . . . to provide a better, crack and porosity free surface that wears longer.

One of the most important parts of the plastic extrusion machines made by the Hartig Engine and Machine Company is the *feed screw*. This part propels heated plastic through an extrusion die under great pressures, and at rates as high as 2000 pounds per hour. Because the slightest amount of wear on the screw is so critical — on some jobs more than 0.010" means replacement — Hartig hardfaces them with REXWELD C by the oxyacetylene process.

The Hartig people have found that REXWELD C extends the life of the screws 400% over unsurfaced screws . . . provides a surface that resists abrasion and corrosion . . . and gives them a dense facing free from surface imperfections — an important factor from the standpoint of product contamination.

Next time you have a hard surfacing job which requires the best in service life and ease of application, ask for REXWELD Hard Surfacing Rods. They are available in many different grades and sizes, and in electrodes bearing the special REXWELD low hydrogen coating.

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53 years of Fine steelmaking

REXWELD HARD SURFACING ROD

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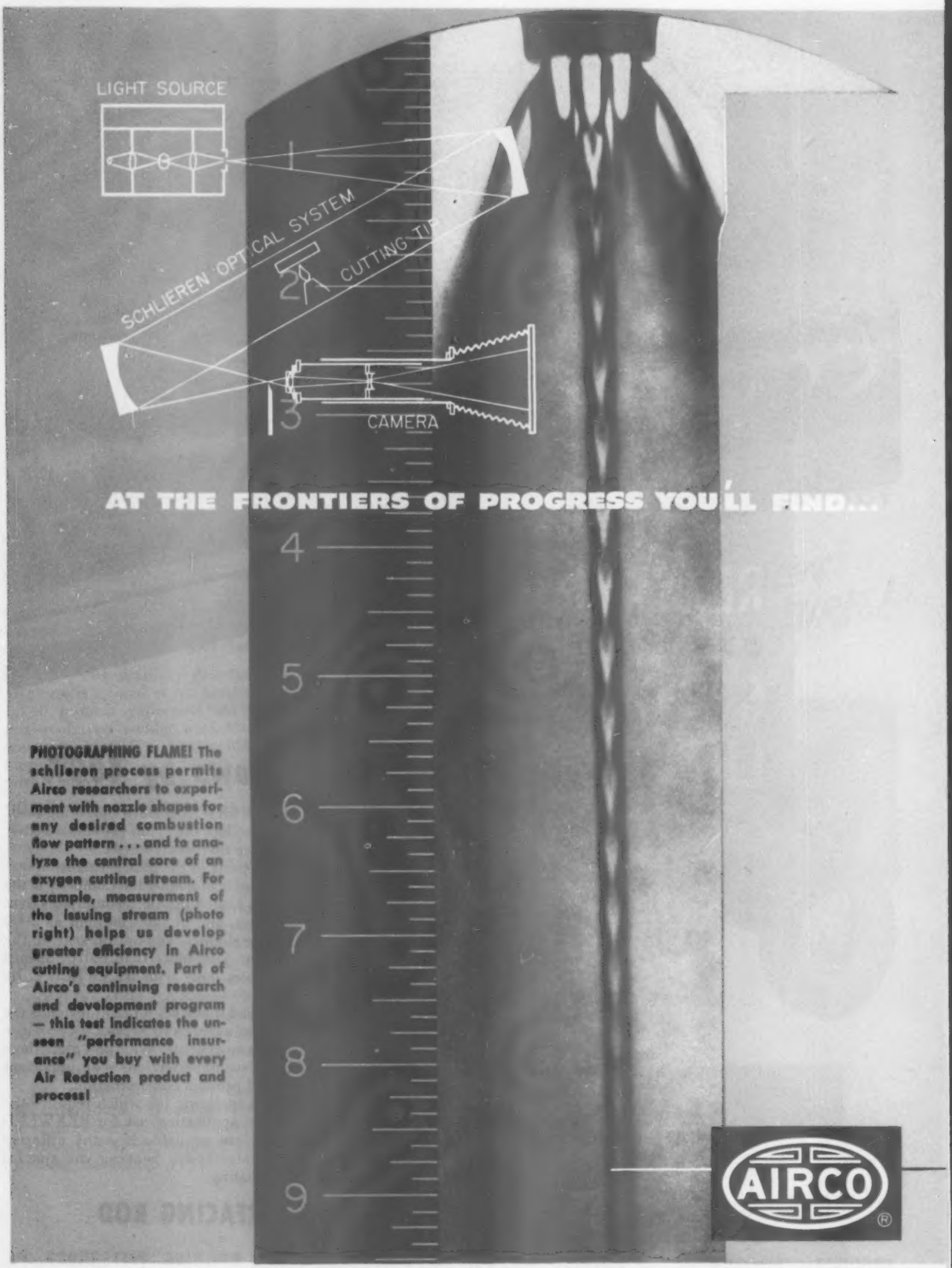
REZISTAL STAINLESS • REX HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS



AT THE FRONTIERS OF PROGRESS YOU'LL FIND...

PHOTOGRAPHING FLAME! The schlieren process permits Airco researchers to experiment with nozzle shapes for any desired combustion flow pattern . . . and to analyze the central core of an oxygen cutting stream. For example, measurement of the issuing stream (photo right) helps us develop greater efficiency in Airco cutting equipment. Part of Airco's continuing research and development program — this test indicates the unseen "performance insurance" you buy with every Air Reduction product and process!

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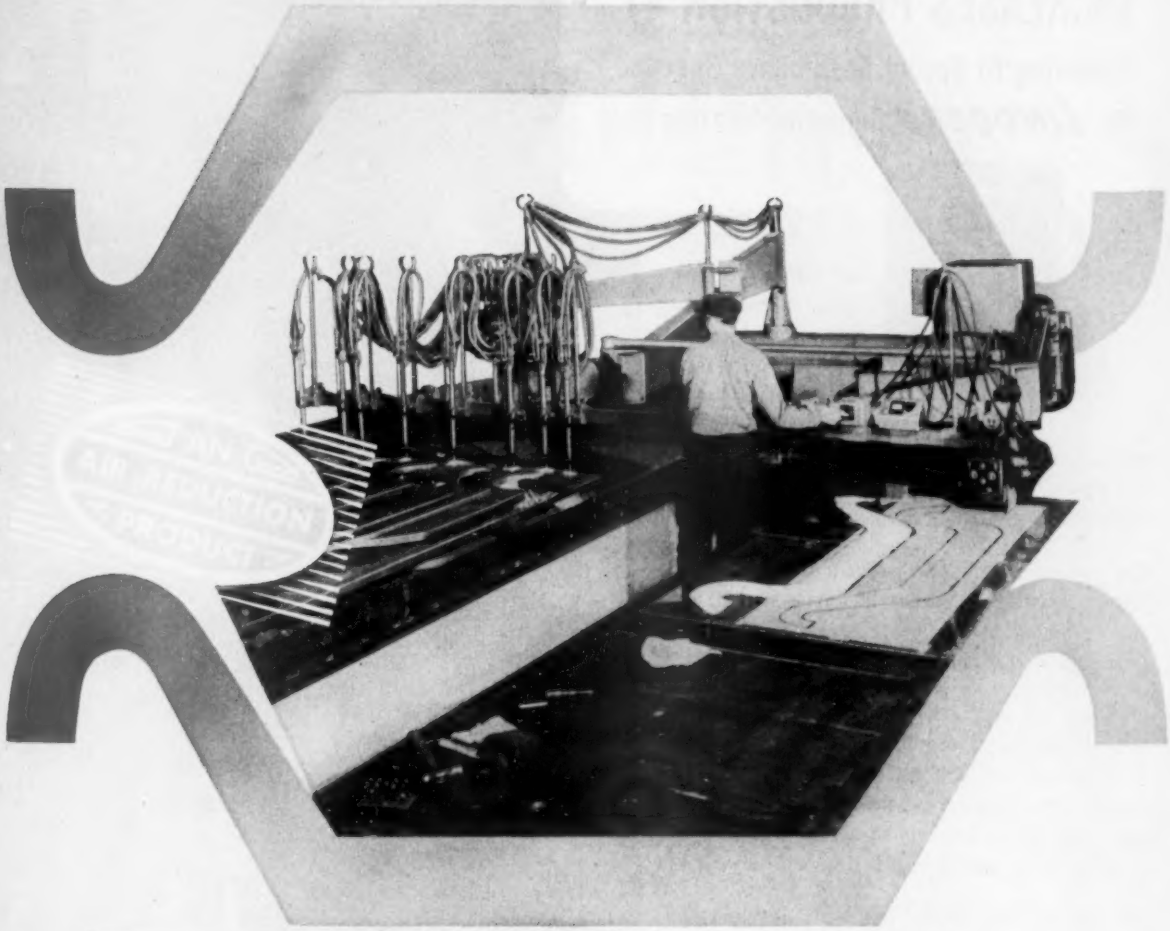
YOKES FOR AN IRON HORSE...



THE AIRCO NO. 50 TRAVOGRAPH mass produces yoke-shaped equalizer bars for locomotives . . . to a 1/16″ tolerance! Torches are automatically guided by an electronic tracer following a low-cost, pen-and ink drawing . . . as four bars are cut simultaneously from 1½″ mild steel, hot rolled plate. The versatile Travograph may be used for straight cutting, beveling or squaring . . . for circles up to 12 feet in diameter . . . or for straight lines of any desired length by adding extra sections of rail. Intricate shapes . . . cut to specification . . . with precision!

And remember, when you need oxygen, acetylene, other industrial or rare gases, think of Air Reduction. A nation-wide distribution system is ready to supply your needs.

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PYLE NATIONAL INCREASES PRODUCTION 47%!

Soldering Of Spring Assemblies Speeded By *LINDBERG* Induction Heating Unit

An hourly production increase of 47% . . and a per-operator production increase of 330% through the use of a Lindberg Induction Heating Unit! These are the money saving facts and figures reported by Pyle National Co., Chicago manufacturer of electrical components.

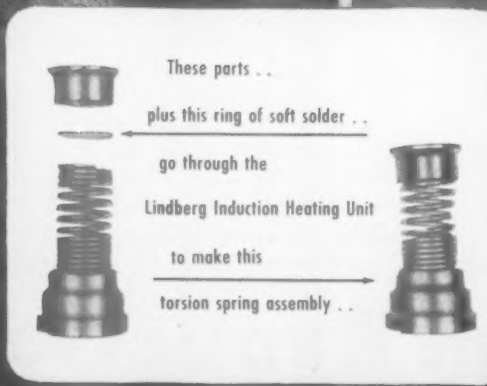
The company uses a 10 KW Lindberg unit for the production soldering of flanges to coil springs in the manufacture of torsion spring assemblies. The time cycle is 11 seconds for each assembly.

Production has been increased to 125 assemblies an hour . . with one girl operating the equipment. This is an hourly increase of 40 assemblies over the former method where soldering was done by a team of three men using gas torches. And the hourly per-operator production is up from 28 to 125!

With the induction heating unit, there are no open flames from gas torches. No extra exhaust fans are required . . there is little danger of burns to operators . . fire hazards are virtually eliminated!

And there is a substantial economy of floor space! Formerly the three torch operators required more than 60 square feet of floor space . . but the Lindberg Induction Heating Unit requires less than 30 square feet.

If your requirements call for production soldering, brazing, hardening, annealing, stress relieving, hot forming, forging or shrink fitting, investigate Lindberg Induction Heating Units. Ask for Bulletin 1440.


These parts . .
plus this ring of soft solder . .
go through the
Lindberg Induction Heating Unit
to make this
torsion spring assembly . .

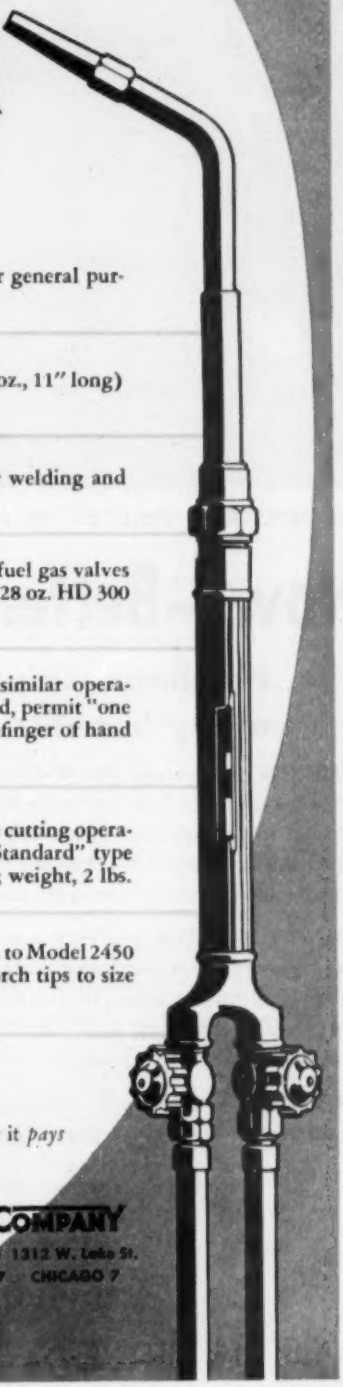
LINDBERG

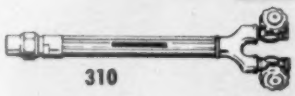
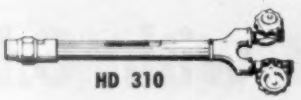
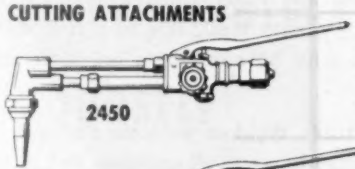
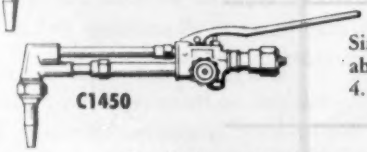
HIGH FREQUENCY DIVISION

LINDBERG ENGINEERING COMPANY,
2450 West Hubbard Street, Chicago 12, Illinois

Which of these most popular models

by VICTOR *best fits your needs?*



300 SERIES WELDING TORCHES	DESCRIPTION, APPLICATIONS
315	A compact 18-oz., 9-inch torch ideal for general purpose welding and cutting.
 310	A medium weight and length torch (21 oz., 11" long) for all around use.
300	A long (14") torch for users of larger welding and heating nozzles; weight 24 oz.
 HD 310	Heavy duty models with high capacity fuel gas valves for large gas flows. HD 310—11" long, 28 oz. HD 300—14" long, 32 oz.
P 310	Especially designed for pipeline and similar operations. Gas control valves, at forward end, permit "one hand" adjustment with thumb and forefinger of hand holding torch. 9" long, 22 oz.
CUTTING ATTACHMENTS	
 2450	Handles a full range of general purpose cutting operations up to approximately 8". Uses "Standard" type cutting tips up to size 5. Length is 13"; weight, 2 lbs.
 C1450	Similar in size, weight and construction to Model 2450 above, but designed for smaller "C" torch tips to size 4. Cuts to approximately 6".

Look for the Victor dealer sign!

—Ask him to show you why it *pays* to standardize on VICTOR.

Dealer inquiries invited VICTOR for welding

VICTOR EQUIPMENT COMPANY

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*1

Welding Arcs

REPORTS FROM WELDORS ON JOBS LIKE THESE INDICATE THAT NEW GENERAL ELECTRIC TYPE W-610-A

Now—Better Welds Faster with G.E.'s

Pipelines, shipyards, fabricators, and builders report many benefits from new AWS Class E-6010 electrode:

PIPELINES Operators like W-610-A electrode because it's easier to use and produces top-flight welds. Slag is easy to remove and "pinholing" is not a problem. The coating does not break down even at high currents. X-rays show excellent deposits and very low porosity.

SHIPYARDS "Now you've got something," say shipyard weldors. On overhead butt welds—one of the toughest shipyard jobs—W-610-A is free of "fingernailing" and "wandering arc." No trouble is caused by reaction pitting. Good set-up prevents undercutting.

FABRICATORS "This is really it! Gas pockets are practically a thing of the past." Weldors prefer the new W-610-A over any other Class E-6010 in the shop. Even on dirty, rusty steel, this new G-E electrode is easy to use. And burn-off rates are high, increasing production.

CONSTRUCTION Weldors welcome the new W-610-A because it's easy to use in all positions and its ability to take high currents speeds construction.

Users have backed up these reports by placing large orders for W-610-A for immediate shipment. But don't take our word on the new W-610-A—find out for yourself. General Electric Co., Schenectady 5, N. Y. 710-4

You can put your confidence in—

GENERAL ELECTRIC

News

Information on equipment, electrodes and accessories from G.E., pioneer in arc welding

ELECTRODE WILL BE INDUSTRY'S NEW QUALITY STANDARD

New W-610-A Electrode

TRY NEW W-610-A YOURSELF at our expense

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General Electric Co.

Why not try this new W-610-A electrode on your toughest mild-steel jobs? Just ask for a free sample from your nearby G-E Welding Distributor. You'll find his name here, and also in the yellow pages of your phone book under "Welding Equipment—General Electric." Contact him today.

Here's the name of your G-E Welding Distributor—

Alabama: Birmingham—Alabama Oxygen, Young & Vann Supply; Mobile—Turner Supply

Arizona: Phoenix—Consolidated Welding Supply

California: Fresno, Los Angeles, Oakland, Sacramento, San Diego, San Francisco, Ventura—Victor Equipment

Colorado: Boulder, Colorado Springs, Denver, Durango, Ft. Collins, Ft. Morgan, Greeley, LaJunta, Longmont, Pueblo—Hendrie & Bolthoff

Florida: Ft. Pierce, Hollywood, Key West, Melbourne, Tampa, Vero Beach, West Palm Beach—Florida Gas & Chemical

Georgia: Atlanta, Macon—Welding Supply & Service; Augusta—Marks Oxygen & Welding Supply; Columbus—Williams Welding Supplies

Idaho: Boise—Olson Manufacturing

Illinois: Chicago, Moline, Morton—Machinery & Welder

Indiana: Evansville—Drill Master Supply; Ft. Wayne, Indianapolis, Richmond—Sutton-Garten; South Bend—Perry Welding Sales & Service

Iowa: Des Moines—Machinery & Welder

Kansas: Coffeyville—Thompson Bros. Supply & Welding Equip.; Hutchinson—Kopper Supply

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Louisiana: Alexandria, Shreveport—Hughes Oxygen; New Iberia—Welders Supply; New Orleans—Equitable Equipment; Opelousas—Daigle Welding Supply, Lake Charles—Welders Equip.

Maryland: Baltimore—Arcway Equipment

Massachusetts: Boston—New England G-E Welding Sales Division

Michigan: Detroit—Welding Sales & Engineering; Grand Rapids—Miller Welding Supply

Minnesota: Duluth—W.P.&R.S. Mars; St. Paul—Production Materials

Mississippi: Jackson—Jackson Welding & Supply

Missouri: Kansas City—Hohenschild Welders Supply; St. Louis—Machinery & Welder

Montana: Billings—Valley Welders Supply; Butte, Great Falls—Montana Hardware

Nebraska: Lincoln—Lincoln Welding & Supply; Omaha—Baum Iron

New Jersey: Kenilworth—Welding Sales

New Mexico: Albuquerque—Industrial Supply Co.; Hobbs—Western Oxygen; Las Cruces, Silver City—Car Parts Depot, Inc.

New York: Buffalo—Welding Equipment Sales; Syracuse—Welding Engineering & Equip.

North Carolina: Charlotte—Dixie Gases, Gastonia—Gastonia Motor Parts

North Dakota: Bismarck, Fargo—Acme Welding Supply; Fargo—Dakota Electric Supply

Ohio: Akron, Cincinnati, Cleveland, Columbus, Dayton, Mansfield—Burdett Oxygen; Toledo—Odland Iron Works

Oklahoma: Tulsa—G-E Welding Sales Division

Oregon: Eugene, Portland—J. E. Haseltine

Pennsylvania: Philadelphia, Pittsburgh—Arcway Equipment

South Carolina: Columbia, Greenville—Welding Gas Products

South Dakota: Deadwood—Hendrie & Bolthoff

Tennessee: Chattanooga, Knoxville, Nashville—Welding Gas Products; Memphis—Delta Oxygen

Texas: Abilene—M&M Welding Supply; Alice, Corpus Christi—Crane Welding Supply; Alpine, El Paso, Marfa, Pecos—Car Parts Depot; Amarillo—Tex-Air Gas; Brownsville, Harlingen—Acetylene Oxygen; Dallas—Hill Equipment & Supply; Houston—G-E Welding Sales Division; Lubbock—Welders Supply; Midland—West Texas Welders Supply; Odessa, Pecos—Western Oxygen; Plainview—Plains Welding Supply; San Angelo—Southwestern Welding Supply; Snyder—Western Welding Supply; Texarkana—Hughes Oxygen; Wichita Falls—Nortex Welding Supply

Utah: Salt Lake City—The Gallgher Co.

Washington: Seattle, Spokane—J. E. Haseltine

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Saved at a cost of only 22^{50} ...and back on duty at 1650°F

This Inconel® radiant tube had served 15,000 hours in a pit type gas-fired furnace at temperatures as high as 1650° F.

Then, finally after four years of rugged duty, a break occurred where the tube joined the burner. The rest of the tube was in good shape, so Electric Auto-Lite engineers decided to salvage it rather than purchase a new one.

This was possible because deposits of Inconel welding wire have the same resistance to oxidizing and reducing atmospheres as the parent metal and good strength at high temperatures.

They called on The Industrial Fabricating Co. of Toledo, Ohio to do the job.

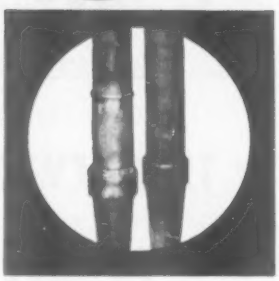
Here's how Industrial proceeded . . .

First, they rebored the old burner casting and inserted a new 8-inch long segment of 3½" O.D. tubing with a wall thickness of .109". Then they joined the new tube segment to the old burner casting with "62" Inconel filler wire. An inert gas shielded process was used to eliminate any possibility of slag entrapment which would weaken the weld.

Finally, they butt welded the new tube section to the other end of the old radiant tube. Now the tube is back in service ready for more long hours of high-temperature duty and the total cost of the salvage job was only $22.50 compared to the substantially higher cost and time required for a new replacement.

This is another case of how an Inco Nickel Alloy welding wire saved an expensive part and helped return it to useful service. It's always good to remember that regardless of the welding method preferred, there is a suitable Inco welding wire or electrode for welding Inco Nickel Alloys. Another thing, too, if you're up against a tough welding problem, Inco's Technical Service is always ready to help you find a solution.

Consult your distributor of Inco Welding Materials for the latest information on their availability.



The Industrial Fabricating Co., of Toledo, was able to save this Inconel radiant tube for Electric Auto-Lite Co., of Cleveland, for only $22.50. The tube was fabricated construction which made the repair feasible. Welder is using a tungsten arc welding torch and "62" Inconel filler wire. Inco's "60's" series of welding wires are especially made for inert gas shielded metal arc welding processes.

Remember, too — it always helps to anticipate your requirements well in advance.

Write today for your free copy of "Inco Welding Materials." It outlines recommended materials for similar and dissimilar joints involving Inco Nickel Alloys.

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MAGNA-WELD LENS

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Bifocal vision through helmet window is limited by improper alignment of window and bifocal segment.

WITH MAGNA-WELD LENS
Bifocal power is provided through entire window area, completely eliminating use of eyeglass bifocal segment.

Now... an effective optical aid which gives the welder who wears bifocal glasses the advantage of "full window" vision.

The Magna-Weld has lenses made of fine ophthalmic glass, precision ground and polished, and mounted in a sturdy frame which fits any standard welding helmet.

Magna-Weld comes in 2 sizes, 2"x4 1/8" and 2"x4 1/4" and in 8 accurate powers — 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25, 2.50.

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In addition to its obligation to furnish to its subscribers a continuously improved editorial content, a magazine has a further duty to the industry it serves. It is obligated to help the industry grow by furnishing accurate and complete sales research, marketing statistics and industrial surveys.

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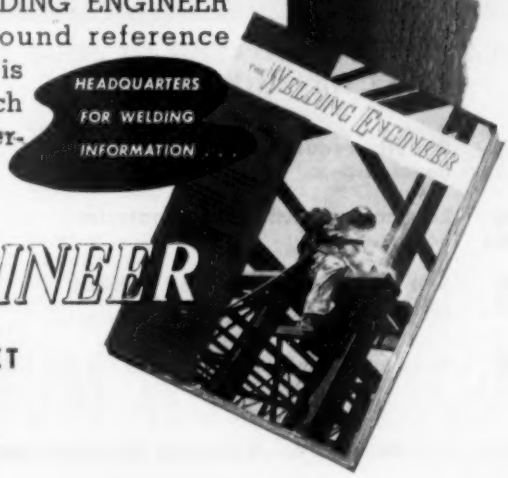
The Mid-June issue is the only year 'round reference issue for market statistics and product information. Make sure our readers—your customers—know about you and *your* product by placing your ad next to your product listing. If your product is bought and used by welding people, it pays you to advertise in the Mid-June issue, where buyers *first look* for sources of supply.

Remember the Mid-June issue of THE WELDING ENGINEER has year 'round reference value. That is why it is such a high advertising value.



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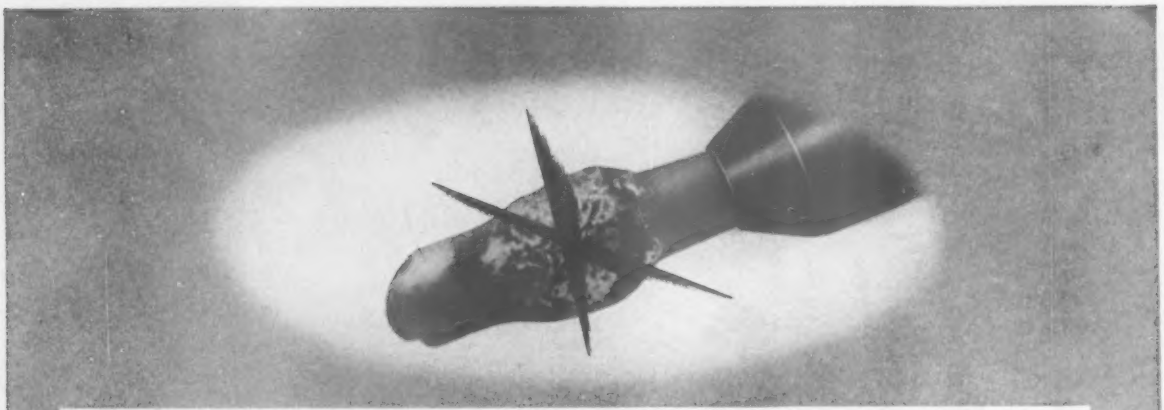

CROSS OUT CONTAMINATION AND SAVE WITH ZIRTUNG ELECTRODES

Work right ahead without interruption with Sylvania's new Zirtung electrodes!

This improved tungsten-zirconium rod really licks the contamination problem and lasts longer on any job. Saves time, saves electrodes and assures sound, dependable welds. Wonderful for mild steel, stainless steel, aluminum, and magnesium. If your nearest Sylvania Welding Distributor can't supply you, write today to: Sylvania Electric Products Inc., Dept. 3T-4304, 1740 Broadway, New York 19, New York.

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Here's why Zirtung saves:

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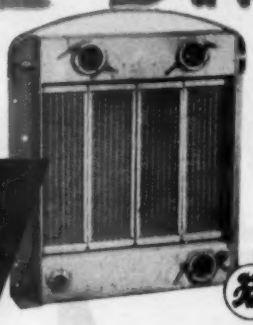
LOW TEMPERATURE SILVER BRAZING ALLOY



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PERFEX INTERCOOLER MODEL R-6428A

The excellent performance and service record of the Perfex intercooler used on LeRoi Compressors demonstrates the value of reinforced resistance to seam failures.

These units, which cool air under conditions of high temperatures and pulsating pressures are built with an extra safety-margin of strength that helps to protect the equipment owner against costly breakdown.

Silvaloy 50 and APW 1200 Flux were selected to provide required bonding strength in manufacture of Perfex intercoolers. Each seamless copper tube is Silvaloy-brazed in a strongly sealed joint to the top and bottom header sheets.

Low Temperature Silvaloy Brazing is helping to speed and simplify brazing production, lower costs and improve results for manufacturers in many fields. Call the Silvaloy Distributor in your area for complete information—or ask him for technical assistance. He will send a Silvaloy Technical Expert to your plant, without cost or obligation to you.

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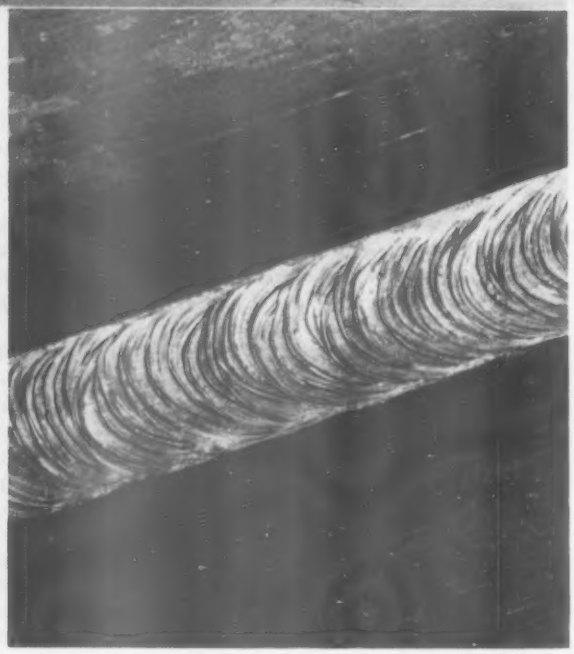
WHAT WOULD RUSSIA PAY FOR ARMORARC ELECTRODES?

Photo courtesy H. C. Phelps, Welding Engineer

THE IRON CURTAIN WAY • Unretouched photo of welded joint on Russian T-34 tank, captured in Korea, now a museum piece at Aberdeen Proving Grounds of the Ordnance Corps. Joint appears welded over and over again...weld spatter is everywhere . . . typical of Red Communism's vaunted "efficiency."



From photo files of the Alloy Rods Company

THE ARMORARC WAY • Unretouched photo of what any capable American welder can accomplish when welding tank joints with *Armorarc* armor welding electrodes, used in numerous U. S. defense plants. *Result:* strong, perfectly fused welds with proper contour and freedom from stress concentration.

AR-18

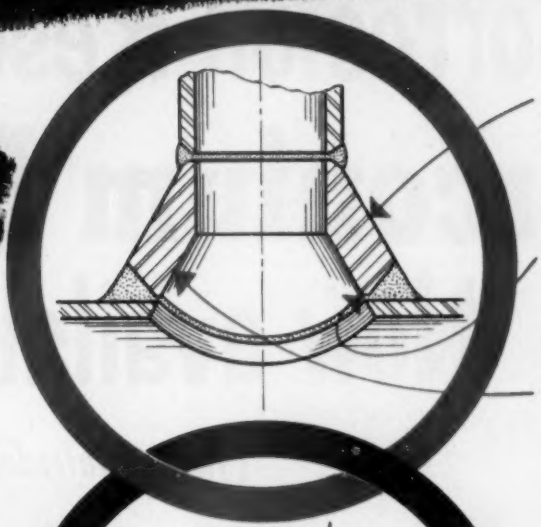
RUSSIA CAN'T BUY a single pound of our *Armorarc* armor welding electrodes . . . or any other Alloy Rods Company brand, for that matter . . . *because the destination of each export shipment leaving our plant is checked carefully* to be sure the hard-won skills of our workers, and the trade secrets of our management, are not "borrowed" by the self-appointed originators of all ideas in the Kremlin. The quality of our products is a direct result of the American competitive system and our way of life—worth protecting in every way we can.

★

SEVEN GREAT ELECTRODE BRANDS
Arcaloy • Armorarc • Bronze-Arc • Nickel-Arc • Tool-Arc • Wear-Arc • Weld-Arc • Write Department M for individual product bulletins... or availability of our 22-minute 16 mm color motion picture, first "inside story" showing how arc welding electrodes are manufactured.

Alloy Rods Co.
YORK, PA.
NO FINER ELECTRODES MADE ANYWHERE

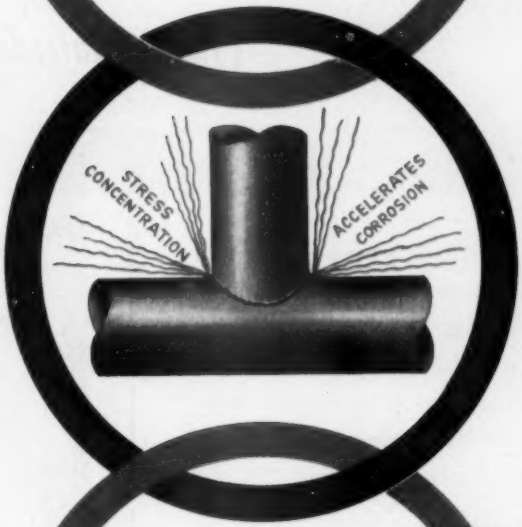
Engineered Reinforcement Against CORROSIVE ATTACK at Branch Connections



Designed with thick, tapered section to relieve stress concentration.

Additional metal prevents branch connection from corroding dangerously thin.

Funneled inlet relieves stress concentration at point of highest magnitude—the *inside* of the crotch.



Accelerated corrosion due to stress concentrations can be readily eliminated . . . by using WELDOLET WELDING FITTINGS at all 90° branch connections.

When corrosion exists in a piping system, it attacks the points of stress concentration most severely. WHY DOWN-RATE YOUR PIPING SYSTEM BECAUSE OF THIS WEAK LINK?

SPECIFY AND USE . . . . . BONNEY WELDOLET WELDING FITTINGS to insure 100% pipe strength at branch connections under corrosive conditions.

WeldOlets, butt-welding

ThredOlets

WeldOlets, socket-welding

FOR COMPLETE ENGINEERING DATA WRITE FOR YOUR BONNEY W-3 CATALOG

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Corrosion Resistant Zirconium Metal Now available

(limited introductory quantities)

The extraordinary resistance of Zirconium Metal to nearly all forms of chemical attack offers many practical and advantageous applications. It compares with tantalum in acid resistance and surpasses tantalum in resistance to alkalies.

Present and promising applications are in the field of electronics, chemistry, aviation and surgical use among others.

Now offered in limited commercial quantities, Zirconium Metal can be machined, welded and cast. Write for literature giving physical, mechanical and chemical properties as well as supply and prices.

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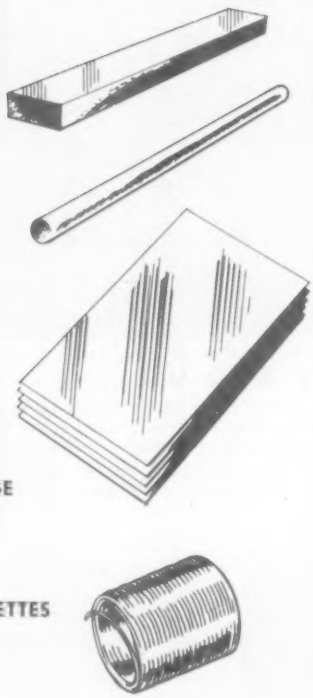

Zirconium Metals Corporation of America

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Moisture Content
STABILIZER

worth its weight in gold

FOR
Low Hydrogen
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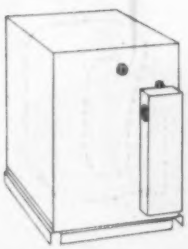
Stainless Steel Electrode
Arc Welding Applications

Specifically designed and engineered to maintain correct moisture content.



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...after nine years steady use

practically no maintenance expense...

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Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.
JDT:mg

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

THE HARRIS CALORIFIC COMPANY

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SERVING THE METAL INDUSTRY SINCE 1905

Tungsten Carbides

good, bad and indifferent...

To a great many people tungsten carbide *is just tungsten carbide.* If those words appear on the container, that's all there is to it. Yet these same people are likely to get pretty fussy when they buy other materials—steel, for instance. They naturally want steel of a certain analysis, they want to know the mill that produced it and whether it has a trade name for identification. They're mighty interested in the *quality* of the steel they're getting!

As a matter of fact, *quality* is as important in tungsten carbide as it is in the steel you buy, the car you drive, the clothes you wear and the food you eat... perhaps even more important, because tungsten carbide is not an end product itself but is added to a piece of costly equipment designed to do a given job better, more efficiently and at less cost. *The only bargain here is in the results you get!*

There is no product in the world that can't be made cheaper and sold for less. Stoody Company, with unsurpassed manufacturing facilities, could more easily than most plants turn out tungsten carbides of inferior quality at a price. It happens, however, that we're interested primarily in quality because we believe it is the only factor which promises full value for the buyer and assures our own success over the years. Things have worked out that way so far—and we still think this is the best way to make friends and build a business.

Borium—the Stoody trade name for pure tungsten carbide as we produce it—is of the highest possible quality. We have been making it for 26 years, were in fact the first to produce this material commercially. We feel that our manufacturing processes are the most efficient in the industry, allowing us to provide highest quality at the lowest possible cost. Our facilities give us absolute control of carbon content, eliminate practically all impurities and produce crushed particles of the generally desired cubical shape.

We spend a good deal of time and money just to make sure of the quality and uniformity of this material. When you buy Stoody Borium, whether it be as bulk, Tube Borium, Borod, Inserts or Castings, you *know* the welding properties of the rods, the shape of the particles, the purity of the material. And you *know* that there is no finer, more dependable product to be had.

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★ . . . that vertical and overhead welding can be accomplished with greater ease by using a MILLER SR WELDER.

★ . . . that the MILLER SR WELDER will lay down a higher quality of weld metal than any other D. C. welder known today.

5
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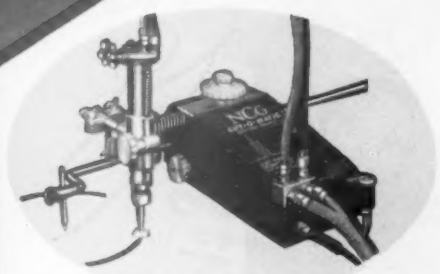
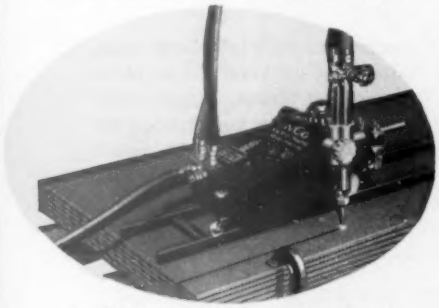
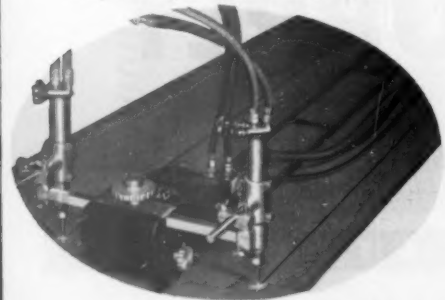


Cutting Circles and Arcs from 3 to 60" ... or more. Rings cut with double torch.



Stack Cutting. Real production economy. Straight lines, circles or arcs.



Strip Cutting. Double torch mounting cuts from narrow to very wide strips.

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81-37A

Kelvinator makes good use of Robotron

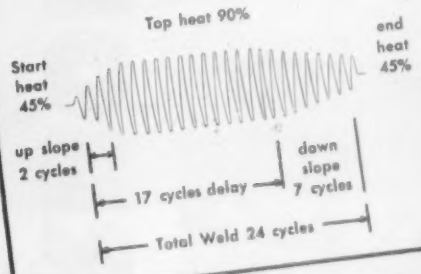
ENGINEER'S LOG BOOK

Customer: Nash-Kelvinator Corporation
Detroit, Michigan

Problem: Welding and sealing Fusite glass-to-steel hermetic terminals to Kelvinator refrigerator compressor housing.

Solution: Robotron NEMA 3B non-synchronous electronic timers with "up-down slope control" and ignitron contactor combination did the job.

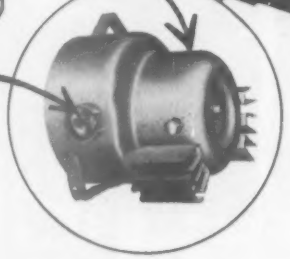
Welding Schedule:



Concentric Welder manufactured by Resistance Welder Corporation, Bay City, Michigan.

The Kelvinator compressor housing

The Fusite terminal



Kelvinator is in full production "Cushion-Welding" the Fusite terminal to the refrigerator compressor housing without breakage or "leakers"!

Through the use of Robotron up-down slope timing controls, Kelvinator accomplishes a delicate production welding job without critical welding schedule or critical weld set-up procedures:

- Reducing possibility of leakers.
- Reducing possibility of breakage.
- Eliminating metal distortion and internal metal stresses.

"Cushioned Power" helps Kelvinator control WELD-ZONE heat to an unbelievable degree.

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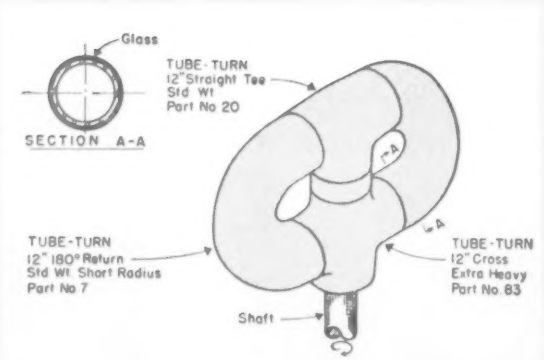
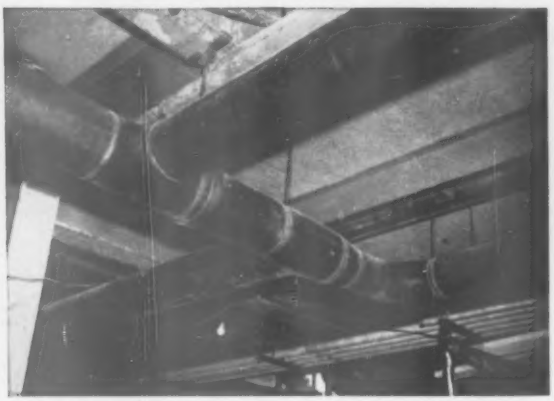
TUBULAR CONSTRUCTION often solves tough machine design problems and here, as in piping problems, Tube Turns' Engineering Service is ready to help you! For example:

Vibration was cracking the glass coating of a plate type agitator for a brine tank in a chemical plant. After repeated replacements, the engineers decided to switch to tubular construction and called in Tube Turns' Engineering Service for design assistance. The resultant design, shown in the sketch, embodies great rigidity and is not affected by the vibration. The expensive maintenance caused by cracking of the agitator's glass coating was eliminated.



FABRICATION IS FAST. Field or shop fabrication of piping assemblies is easier when welders can count on the dimensional accuracy of TUBE-TURN Welding Fittings. True circularity and uniform wall thickness assure perfect lineup and fit.



AT GENERAL ELECTRIC. Two 16-inch steam mains, at boiler plant of the new G-E Appliance Park in Louisville, will help distribute 900,000 pounds of steam per hour efficiently. Welded piping, using TUBE-TURN Welding Fittings and Flanges, was specified for all critical lines in the new plant: high and low pressure steam, gas, domestic and mill water, and compressed air.

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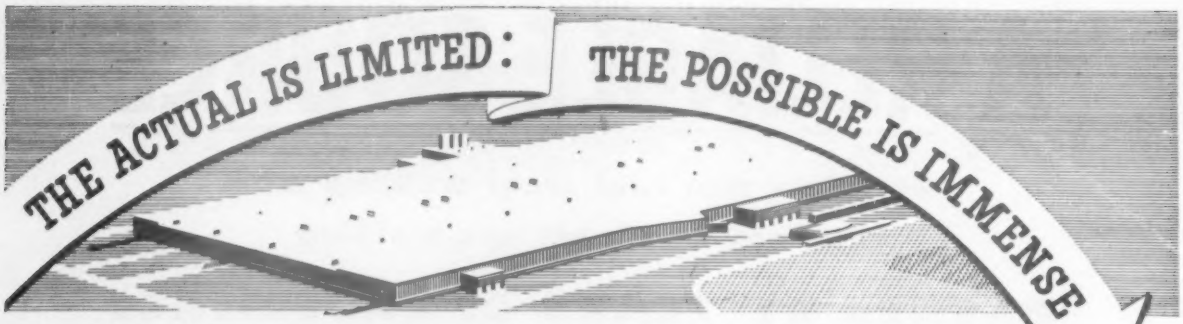

NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1953

"MANUAL LINCOLNWELD" CUTS COSTS 67%

USE of "hidden arc" welding with granular flux and positioners is cutting welding costs two-thirds in the fabrication of circuit breaker tanks at the Santa Clara plant of the Pacific Electric Manufacturing Corp. Exterior and interior welds are produced by positioning the welding gun of "Manual Lincolnweld" in a simple fixture. The work is then rotated beneath the welding gun with power rollers.

Currents of 375 to 400 amps concentrated on ⅝" electrode produce full penetration at 12 to 15 inches per minute without need for plate preparation. Welds are self-cleaning to eliminate costly time in removing slag between passes as needed on conventional hand welding practice.

Undoubtedly results like these can be duplicated in your shop today. Consult a Lincoln welding engineer. Learn what new Lincoln developments in faster, easier welding can be applied to your operations to improve the quality of your work and cut production costs.

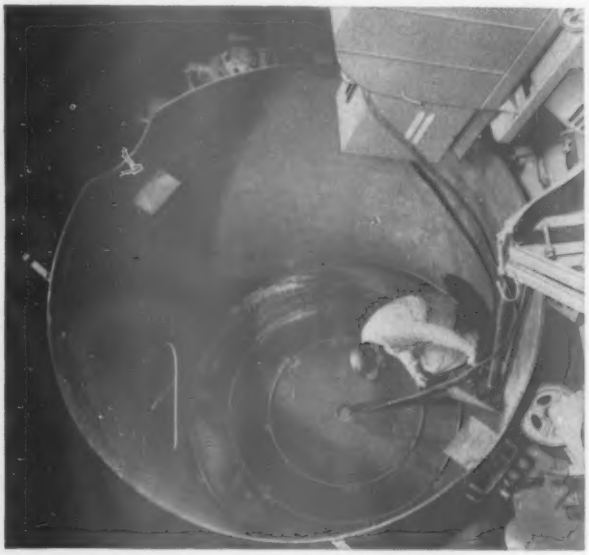

Fig. 3. High Current Density *on continuous electrode provides 100% penetration in one inside and one outside weld. "Hidden arc" welding in granular flux avoids arc rays and spatter . . . saves weld cleaning.*

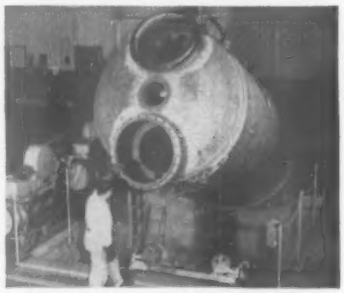

Fig. 1. Fabricates Tank *from ½" plate with "Manual Lincolnweld". Welding speed is 12 to 15 inches per minute at 400 amps.*

ELIMINATES JOINT PREPARATION

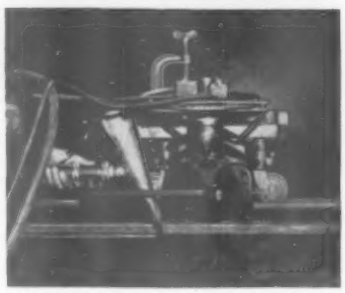

Fig. 2. Welding outside vertical seam *with "Manual Lincolnweld" gun mounted on simple rail fixture. Welding speeds are from 2 to 4 times faster than conventional hand welding.*

SAVES MANHOURS

GET THE FACTS—*Cost-saving benefits with Manual Lincolnweld are in Bulletin 1303. Write on your letterhead to Dept. 1703.*

THE LINCOLN ELECTRIC COMPANY

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THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

ESTABLISHED 1916

THE WELDING ENGINEER

APRIL, 1953

Mig and Tig Welding

SOMEBODY really ought to do something about the gobbledegook that is cluttering up our own industry. Since nobody else seems inclined to stick his or her neck out, THE WELDING ENGINEER is going to step forward. If you don't agree, that's your privilege, but we hope that you will at least listen.

Arc welding is an excellent term. Resistance welding, while longer, is equally accurate. Spot, seam, flash and butt welding are easy to say and remember. Gas welding, though brief, is not specific, whereas oxyacetylene welding is specific but not brief. Still we have no real quarrel with either phrase. Nor with the terms flame-cutting, flame-hardening, etc. Nor with such terms as brazing, braze welding and hardfacing.

Actually, the gobbledegook didn't amount to very much in our industry until the advent of the inert-gas-shielded arc-welding process. That name alone should show you what we mean. Later the verbiage was officially shortened to inert-arc welding, which is wholly wrong. It is not the arc that is inert but the gas that shields it.

But let's see what happened when the original inert-gas process with the tungsten electrode was supplemented by a process employing a metal electrode:

Inert-arc metal-arc welding. (Why two "arcs"?)

Inert-gas metal-arc welding. (Better but still four words to modify the noun "welding.")

Inert-gas metal-arc welding using a consumable electrode. (Some people actually say all that.)

Inert-gas welding using a non-consumable electrode. (If they mean "tungsten," why not say so?)

Tradenames such as "Sigma," "Heliarc," "Heliweld," "Aircomatic" and the like come much easier to the tongue. But each of these names refers only to the particular products of a particular manufacturer. What we need are universal terms.

BOTH the consumable-electrode and the non-consumable-electrode processes involve arc welding. As everybody knows that, why not take it for granted? What our terms should emphasize is the distinction between the electrodes. With this thought in mind, THE WELDING ENGINEER offers the following two terms for serious consideration by the industry:

For the non-consumable electrode: tungsten inert-gas welding. It can be shortened to "Tig."

For the consumable electrode: metal inert-gas welding, which can be shortened to "Mig" (nothing to do with Russian jets).

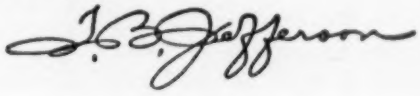
So meet "Mig" and "Tig" welding. You will probably be seeing a lot of them from now on in the pages of THE WELDING ENGINEER.

THIS won't be the first battle that we have fought in the interest of simpler terminology. For thirteen years, we have been calling the man who uses the arc or the welding torch a "weldor" and not a "welding operator." Now the Merriam-Webster dictionary has accepted "weldor" as a legitimate word. Still there may be some who wonder why we spell it o-r instead of e-r. Well, there are perfectly good English nouns such as sailor and tailor to designate men who work at particular occupations. Our real reason, though, was to distinguish the man from the machine. When you say "welder," which do you mean?

We also feel that there is lots of room for improvement in the AWS definitions of welding terms. "By many words is meaning obscured," a Chinese sage wisely observed many centuries ago. What would he say to the following definition:

"Oxyacetylene Welding: A gas-welding process wherein coalescence is produced by heating with a gas flame or flames obtained from the combustion of acetylene with oxygen, with or without the application of pressure and with or without the use of filler metal."

Sounds like the lawyers who write the patent applications have been given a free hand. However, any attempt to uncomplicate something that has been allowed to grow in complexity for 50 or 60 years must necessarily meet with resistance. And, as you learned in elementary electricity, resistance generates heat. So our pleadings for simplified welding terms and definitions will have to be fed in small doses. However, you can expect to hear from us again on the subject.



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the new MUREX® type R

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Murex now gives you the first real improvement in Type E-6010 electrodes in many years.

A completely redesigned electrode, the new Murex Type R welds with less spatter—digs deep without undercutting—does not spear—takes higher currents with no sacrifice in performance—has outstandingly uniform arc action.

Physical properties too, are excellent—more than you'll ever need in E-6010 applications.

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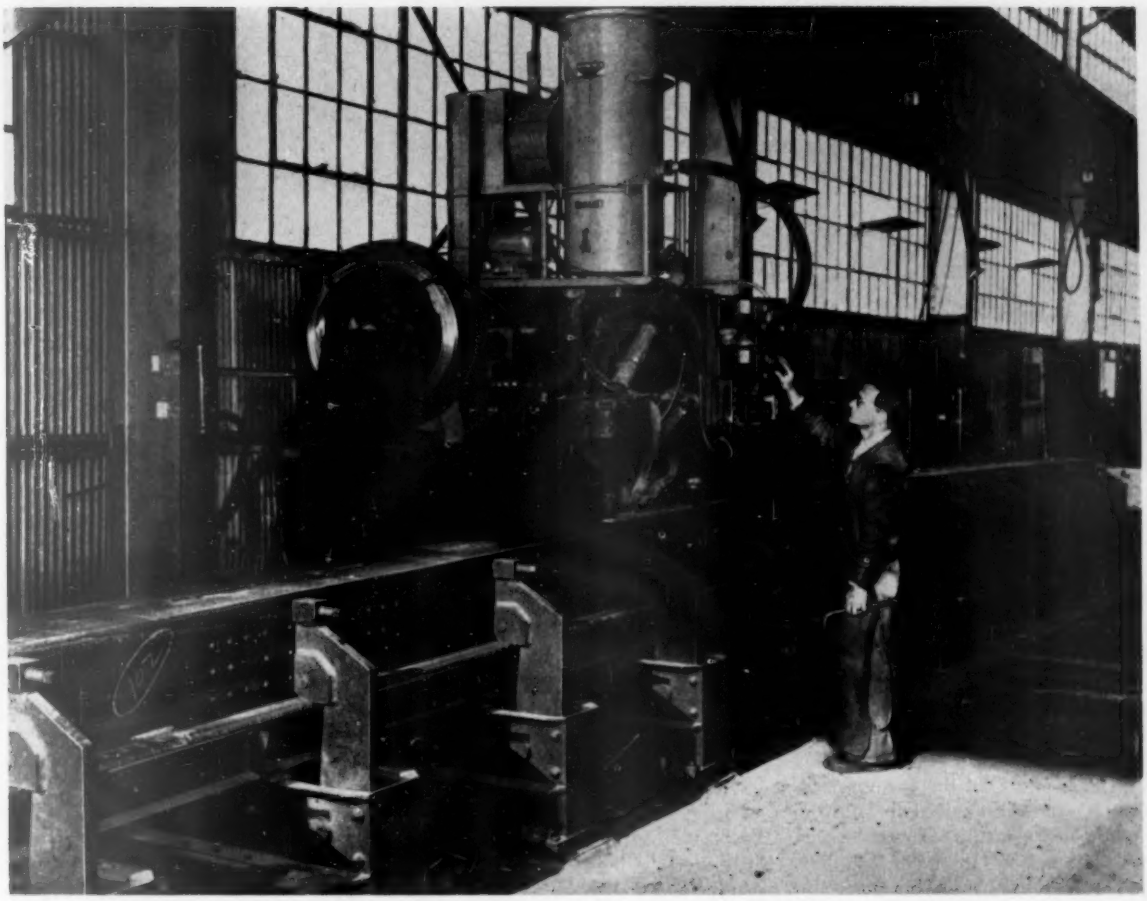


1—THIRTEEN hydraulically operated arms on each side clamp the center sill Z-bars for submerged-arc welding

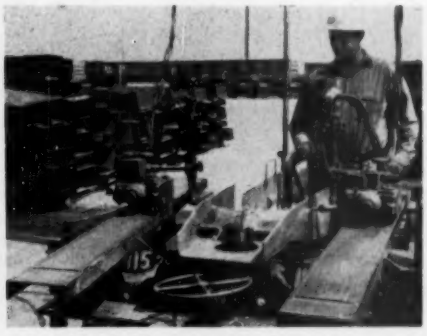
Underframes—

A job for automatic welding and cutting

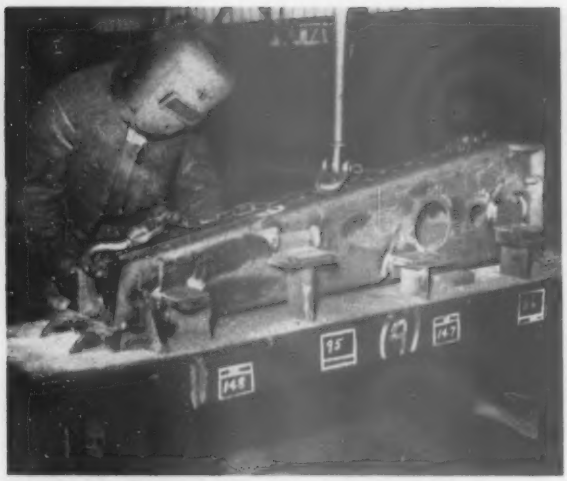
BY FRED M. BURT

WHEN it comes to handling heavy, cumbersome weldments, there are very few things that are worse than a freight car underframe. Highly efficient methods for doing this tough job of structural production have been evolved at the Maywood plant (Los Angeles) of Consolidated West-

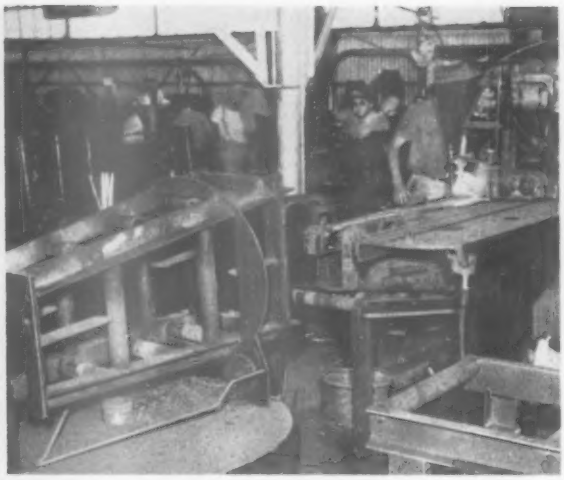
2—CUTTING out plates for bolster bottoms. Torches are drawn inward, as they follow the jig guides, in order to make diagonal cuts



3—UNEQUAL webs are trimmed to even, accurate dimensions by automatic cutting



4—CROSSBEARER half sections have been submerged-arc welded and clips have been tack welded into place



5—ROTARY jig at left is for turning over a bolster half after a seam has been welded (see photo 6)

ern Steel, a division of United States Steel.

This article describes the fabrication methods employed for 1,450 underframes for 40-ft boxcars of the Santa Fe Railway. These were being built at the time of the writer's visit. The highly mechanized production set-up has also turned out 12,500 other frames — for box, auto box, gondola and refrigerator cars for four railroads: Union Pacific, Santa Fe, Southern Pacific and the Pacific Fruit Express.

One important factor that should not be overlooked is that this is a precision structural job. The heating and cooling incident to welding can set up strains or cause distortion that would hinder assembly into the completed freight car. Strains and distortion have been reduced to a negligible amount by a careful design of the assembly jigs.

The excellence of the operation as a whole is because of the extra ordinarily large and diversified experience that Consolidated Western has had with heavy welded fabrication. The company has made hundreds of thousands of tons of large-diameter welded pipe for gas and oil lines. It also established many records for quality, quantity and speed in wartime shipbuilding, when it had nearly 70,000 men at work.

First Comes a Backbone

The "backbone" of the frame is the central sill. This is made by welding together two Z-bars by the submerged-arc process. A typical Z-bar weighs 36.2 lb per lineal foot and has an upper flange 6 27/32 by 13/32 in. in cross-section, web 12 7/8 in. by 13/32 in. and a bottom flange 4 by 3/4 in. In preparation for welding, the two Z-bars are clamped in a holding fixture (photo 1). Each side has 13 hydraulically operated arms to hold the Z-bars firmly in position for welding. Clamping is regulated from a control panel at one end. First the two center sets of arms bear against the bars; then the next three sets on each side and so on to the ends of the jig. The result is the bars are pulled down towards both ends to bow up in the center and form the proper camber.

After the bars have been brought into perfect alignment, they are tack welded at indicated spots from end to end. Then the full length is welded with an a-c twin-head submerged-arc arc welder. Welding is done continuously at a speed of more than 60 ipm. The set-up requires elaborate electrical equipment, including two 1,500-amp transformers.

At one end of the holding jig, there is a platform at a convenient height for replenishing the flux, contained in the large tank shown at the top of photo 1. Bags of flux are brought to this platform on large pallets by a cab crane. Also on the platform are extra rolls of welding wire, which are lowered into place from an air hoist on a jib crane. Similar flux-supply platforms are located at other submerged-arc welders.

To follow the backbone analogy further, there are also ribs. These are the bolster, crossbearer and crosstie halves, which are welded to opposite sides of the center still backbone. The bolster and crossbearer halves are each made up of two formed sections welded together, while the crossties are shaped from standard structural channels.

Flame-Cutting Plates

Plates for the cross members are cut to size by flame-cutting machines. Photo 2 shows a machine making dual cuts in 3/8-in. plate for bolster bottom sections. A spring-loaded device draws the torches inward (as they follow the jig guides) to make the diagonal cuts. The cut plates for the cross members are stacked on blocks and then carried by a three-ton fork lift truck to the edge of a 70 by 400 ft building to await forming operations.

In the inner end of the building are three 400-ton hydraulic presses and a heating furnace. One of the presses is used to form the two half sections of the crossbearers and the top bolster pans; the second press does only hole punching and notching. The bolster bottom pan plates are stacked at the rear of a heating furnace to undergo heating and forming. A valve operates to push a bottom plate into the furnace and force the plate already in the furnace towards the front and out. The heated plate is moved across the aisle to the third press for forming.

6—TWO halves of a bolster in twin jig for automatic welding

7—UNDERFRAME end shows the bolster top cover plate (right), bolster, stringer and crossbearer—all perpendicular to the center sill "backbone"

Hot forming of bolster bottom pans produces unequal webs. Photo 3 shows the automatic flame-cutting equipment that trims the two webs simultaneously to even and accurate dimensions.

The formed cross member parts are carried in steel tote boxes by crane (two 25-ton cab cranes serve the building and intervening yard) to the edge of another building, 100 by 360 ft. Here a second crane picks them up and carries them to their submerged-arc welding areas.

Joining Cross Members

First step in welding together the half sections of the cross members is to pick up the sections and place them on a roller conveyor. They are moved into the two jigs that are used for fitting and tack welding, then lifted out and rolled to a dual jig-roller device. This drops at one end to level the seam for the welding. The roller conveyors are so arranged that they carry the tack-welded sections to a turntable at each end of the track for the single-head submerged-arc welder.

When the welding has been completed on the first seam of a crossbearer, the weldor's helper raises a depressed roller and rolls the crossbearer onto the turntable. He turns it over by hand and then rolls it back to the jig for the welding of the other seam. While he is doing this, the welding head is moved on in order to weld the other crossbearer. When the welding is completed, the unit is rolled onto its turntable and turned 90 deg. It is then pushed along another roller conveyor, from which it is picked up by an air hoist on a jib crane and swung over to another jig. Clips are tack welded on (photo 4), after which the crossbearer is ready for inspection and final assembly.

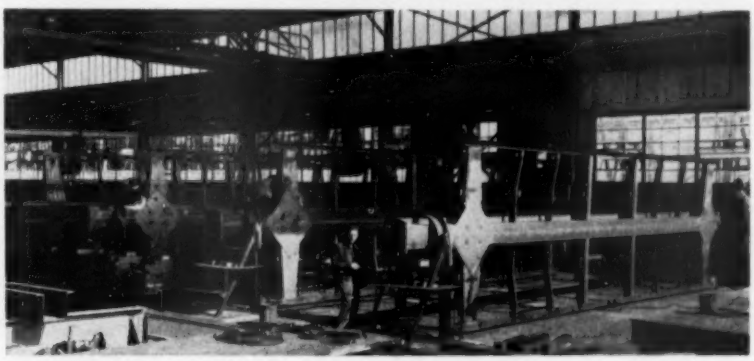
The top and bottom pans of the bolster are welded together in much the same manner. The jigs for tack welding are, however, heavier and more elaborate. The bottom pan is firmly positioned and held by seven horizontal heavy screws on each side. These screws are turned with an air wrench. Similarly, two vertical screws hold down the top pan tight against the lower section.

The manner of turning the bolster over differs from that of the crossbearer as the bolster is too heavy for manual turning. The helper rolls the bolster half off onto a rotating jig (photo 5) after one seam has been welded. It is then turned over and brought back for the second seam. During the turning operation, the other bolster half is being given its first seam. Photo 6 shows the two halves of the bolster in the twin jig for welding. As soon as the weld is completed on the half in the rear, that half will be turned over while welding is continued on the half in the foreground. Finally, each welded bolster half is rolled off to the side to go to another jig, where a side bearer, stringer clips and cap are tack welded on.

While these cross members are being weld-fabricated, the center sill is having two bolster center fillers riveted in by hydraulic riveter. Angle braces are also tack welded in place.

All the underframe components are asembled to the center sill and to each other by tack welding them together.

(Continued on page 52)



8—FINAL welding is done on rotary positioners. There are seven of them

1—DESIGNER Robert Winston looks at structural framework required to build his abstract sculpture

2—STUD-WELDED pins—some 2,500 of them—are installed to support the metal mesh that holds the plaster

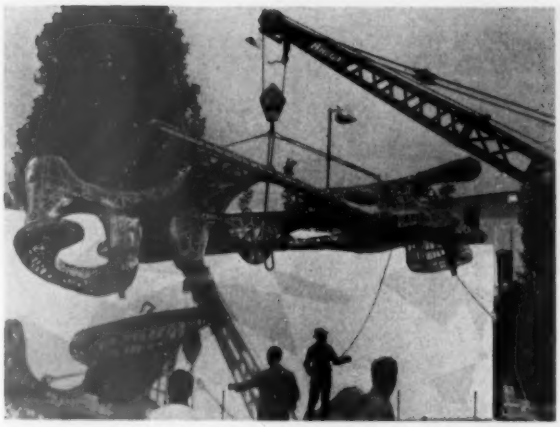
No Drawings . . .

5—WHALE starts out small. Note the terrific difference in size between the model and the framework

6—WILLIE the Whale is "plastered," but children aren't afraid to climb down into his wide-open throat

7—REMEMBER the old woman who had the novel idea of living in a shoe? Here was the start of her house

8—OVERSIZE shoe has been completed for the old woman and her family. Shoelace is really a fire hose



3—LOWERING the steel skeleton into its place at Lakeside Park. Next operation will be the plastering

4—CHILDREN love it. Naturally, since it's their "fun tree," planned specially for them to slide and climb on

They Just Grew!

These weird creations were made to give fun to Oakland children. The men who built them had to throw ordinary methods of fabricating "out the window."

THESE huge figures at Lakeside Park in Oakland, Calif., appear to be made of concrete and plaster. Inside them, however, are complicated welded skeletons. The welding was done by Joe Macri and Murray Hood, who are in business as the Macri and Hood Iron Works, Oakland.

Abstract Sculpture

Photos 1, 2, 3 and 4 depict the evolution of a giant abstract sculpture designed by Robert Winston, instructor at the California College of Arts and Crafts. Though not meant to resemble anything at all, it offers the child shelves to climb onto, tunnels to crawl through and holes to shout into. This amazing structure has a length of 31 ft, a height of 8 ft and a width of 15 ft. It was built from a model 15 in. long by using a system of three-dimensional coördinates. No drawings were made; the structure was designed and engineered as it came into being.

As may be seen from photo 1, the framework is made of structural tubing, rolled shapes, channels and flat bars. The main backbone is 6-in. structural tubing, and the internal members are made of tubing 3 and 4 in. in diameter. Bar stock 1/4 by 1 in. was cut, hammered and bent to shape to provide the framework for the skin. The various members were manually arc welded together, after which some 2,500 headless pins were stud welded to the metallic skeleton (photo 2). The pins provide a means of hooking on the mesh or expanded metal for the plaster.

The sculpture was covered with 1½ in. of plaster and then painted a light green. Altogether, it weighs 7,000 lb.

Willie the Whale

Photo 5 shows us the model and framework of the giant whale. Because the head of the whale has little back support, the upper lip was heavily reinforced to act as a structural member. The finished whale is shown in its pool in photo 6.

Before and after views of the old woman's shoe are shown in photos 7 and 8. The welded steel framework was covered by 1½ inches of plaster. The size of this monster shoe may be gaged somewhat by the fact that a fire hose made the shoelace.

Macri and Hood were given a free hand in the creation of toadstools, which turned out to be things of weird shapes and scalloped edges. Photo 9 shows toadstools before they received their plaster coatings, and photo 10 the finished products.

Photos 1 and 2 are courtesy of George Tagney, Oakland; photos 3 and 4 are from Nelson Stud Welding. The other photos are from the Oakland Park Department.

9—TOADSTOOL frameworks. Note heavy bracing used on the stems

10 — FINISHED toadstools have weird shapes and scalloped edges

Braze Welding on

Many weldors believe that braze welding is suited only to the repairing of small articles. But it is even more effective in making big repairs on heavy equipment, as these six examples illustrate.

BY HERMAN C. PHELPS

1—LOOKS as though the broken pieces of this induction furnace shell could never be put back together. The furnace is used for melting brass

OLD MAN TIME has the final say when it comes to what to do about equipment breakdowns. In many instances, loss of production caused by damage to heavy equipment far overshadows the repair or replacement cost. Since time means money, the management votes for the quickest possible repair method.

That usually means welding. But the top management has merely passed the buck along. Someone farther down the line must make an even more important decision. Which welding process and which filler metal shall be used? Many times the choice of the wrong process or the wrong filler metal has meant the difference between a lasting repair and one that was merely a wasted effort.

Let's say that the broken part is of cast iron, as it is in so many cases of equipment breakdown. What do you do to repair it?

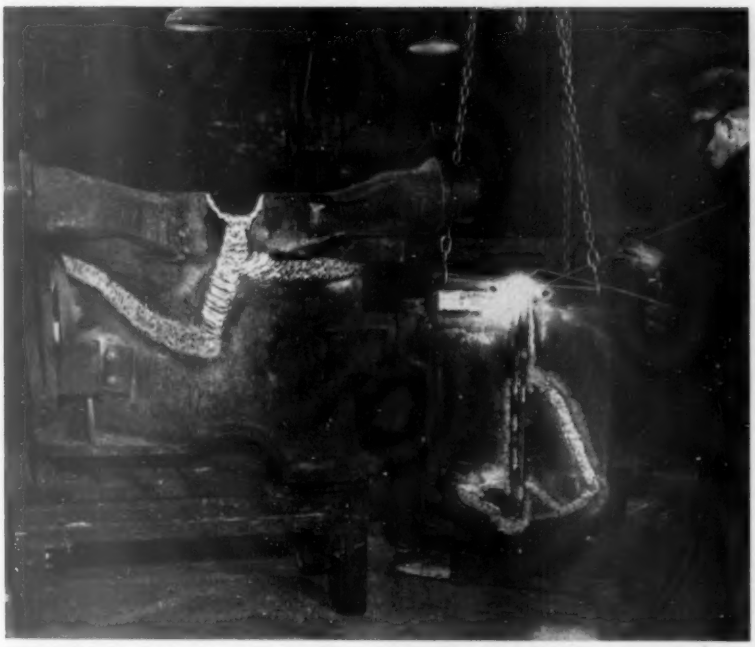
You can weld cast iron with a mild-steel or an iron electrode, but it's not easy. You can use nickel-base electrodes with excellent results, but such electrodes are getting scarcer all the time because of the nickel shortage. So what's left?

BRASS OR BRONZE?

Braze welding is one answer. It takes half the time needed to weld with cast-iron or steel welding rods because it requires no elaborate preheating and slow cooling. But there are a number of copper-base alloys on the market suitable for arc and gas welding. It would seem difficult to chose between them, but here's a piece of information that may help you. No filler metal does so consistently well in the joining of heavy cast-iron parts as the particular composition known as low-fuming bronze.

Though called "bronze," this yellowish alloy is actually a brass since it is a very nearly pure copper-zinc alloy. A true bronze is, of course, a copper-tin alloy. "Low-fuming bronze" contains around 58% copper and about 40% zinc, plus tin, iron, manganese and silicon. The silicon, present in a very small quantity, gives the alloy its low-fuming property. This brass alloy may be used for the braze welding of either ferrous or non-ferrous metals. Its melting point is about 1,625 F, and it is

3—BROKEN bed of a rod extrusion press had to be braze welded with the 25-ton cylinder in place. And the break extends under the cylinder



2—BRAZE-welded repair took six hours of labor, 75 lb of low-fuming bronze rods, one cylinder of oxygen, less than a cylinder of acetylene

Big Repair Jobs

applied by the welding torch only.

Braze welding with low-fuming bronze has been done on castings many times larger than would be found ordinarily in the average industrial plant. Evidence of its success in repairing very large sections is provided by the accompanying photos. One of the braze-welded repairs pictured has stood up to over ten years of extremely strenuous service.

A Brass Tilting Furnace

Let's first look at photos 1 and 2—a very interesting repair job. An induction furnace, used for melting brass, rests on two arms or trunnions for tilting and pouring the molten brass into the mold. The furnace is tilted on the axis of the trunnions. After the metal has been poured, the operator presses a switch to bring the furnace back to vertical position again.

One time something went wrong with the switch. The furnace dropped back into position too fast and struck the platform, breaking off the trunnions and several pieces from the bowl. Photo 1 shows the extent of the damage. The furnace shell is of cast iron and varies in thickness from $\frac{3}{4}$ to $1\frac{1}{2}$ in. A new shell could not have been procured in less than six or eight months, so a repair was necessary if the furnace was to stay in service. But what a job for the weldor!

Difficult Flame-Cutting

The furnace shell was lined with bricks and fire clay, which, of course, had to be removed as an initial step. In a repair of this nature, it is necessary to bevel off the edges of the crack so that a vee-shaped groove will be formed in which weld metal can be deposited. A cutting torch with a special tip for cast iron was used to cut a rough vee. This special six-hole tip, handled with two holes in a straight line with the cut, removes the slag that ordinarily hampers cast-iron flame-cutting and clogs and glassifies grinding wheels.

The proper technique is to oscillate the cutting flame sidewise to form half circles or "new moons" at regular and short intervals. The metal is thus worked out by the oscillating flame, which causes a constant stream of slag and molten metal to flow through the kerf. With this cutting technique, the preheat flames are

4—END of water pump for extrusion press is being repaired on the job, without dismantling of the pump

5—SAME water pump as in photo 4, but another repair job, at a different time, made on the other end

6—STEAM hammer is subject to severe shock and impact. The fracture ran across the middle of the frame and bed, at points of greatest strain

highly carburizing — ordinarily, the length of the streamer of excess acetylene should equal the thickness of the cast iron. These long flames preheat the metal in advance of the cut and also add extra heat to the oxidizing cutting flame.

On this particular job, the intense heat of the cutting torch also helped to burn out the graphite, embedded oil and fire clay left sticking to the casting. A clean surface is an indispensable condition for a successful braze weld.

Grinding Must Be Done

The flame-cut edges, as well as areas at least three inches away from the groove, were ground with portable grinders to provide fresh, bright metal for brazing. Grinding is another must preparation for braze welding. Without it, you just won't get good tinning action and the proper "tie in" with the filler metal.

It is likewise important not to weld cold. On this job, special preheating equipment was not needed, but preheating was done by washing the flames of the welding torches well over the surface. This served to remove the chill before actual welding started.

Naturally, the weldor began at the bottom of the vee. He used a No. 8 tip (drill size 45); this may seem small to many weldors, but it avoided the danger of overheating. Many and many a casting has been ruined by too much heat.

Starting at the center of the casting, the weldor traveled several inches in each direction. Utilizing a skip technique to neutralize stresses, he built up the entire groove in one pass. The heat, gradually accumulating in the casting, built up to a maximum by the time the heavy trunnions were reached.

The weldors on this particular job watched the temperature of the base metal. If it fell below 500 F (checked with temperature-indicating pellets), torch heating was done to bring it up to the proper temperature. Loss of heat in the base metal became noticeable when the rod failed to tin smoothly and evenly.

Caution to weldors: If the molten metal is thin and flows fast, then you probably have too much heat. Take some time out and let the casting cool a bit before you go on. It's better to lose a little time than to spoil the whole job by overheating.

In braze welding cast iron, proper cooling is as essential to success as preheat. When all the welds had been made, the furnace shell was covered with sheet asbestos so that it would cool slowly. To avoid drafts (which might have had a disastrous effect upon the weld and heat-affected zones), the doors to the welding shop were kept locked during the preheat, welding and cooling periods.

Preparation time on this repair was three hours, and the welding took another three hours. The period for cooling had to be added to the furnace downtime but not to the actual cost of the repair. Material costs were comparatively low: 75 lb of ¼-in. low-fuming bronze rods, one cylinder of oxygen and less than a cylinder of acetylene. The extent of the repair is shown by photo 2.

A Broken Bed

Now let's look at another repair. One that came up to bat with two strikes already against it.

The braze-welded block in the foreground of photo 3 is the bed of a 2,750-ton extrusion press. The press is used in a rod mill to squeeze out rods from billets of hot metal, just as you squeeze out a ribbon of tooth paste from a tube. The pressure is tremendous. When an 8-in. billet is going through the press, the pressure exerted on the metal ranges close to 100,000 psi.

This terrific pressure was applied to a billet of a hot copper alloy that had jammed. The result was catastrophic. The cast-iron press bed was broken from the impact created by the recoil. Upon close examination of the break, it was found that the bed design was not the best and the bed casting was also defective. Here was an unholy mess all right!

The cast-iron bed has a top surface area of 16 sq ft (4 by 4 ft), stands 14 in. high and is hollow. It weighs approximately two tons. Inside, reinforcing ribs are provided for extra strength. The point of fracture was between these ribs and parallel to them. A large, if not the biggest, portion of the crack was covered by the cylinder, as you can see from the picture. The main cylinder weighs about 25 tons.

Production in the rod mill depends upon the extruded product made by the press. A new press costs nearly $1,000,000. And a new bed casting, even had one been immediately available, couldn't have been installed in much under two weeks. That would

represent two weeks of wholly lost production.

How would *you* solve this particular problem?

Being a smart boy and a regular reader of THE WELDING ENGINEER, you say braze weld the cast iron. Okay, brother, but it's not easy. Look at the picture again and see how the break extends on under the cylinder, where the weldor can't get at it. Dismantle the press? That little operation takes a week—and at least another week to put it back together again.

So what *would* you do?

The decision reached was to make a temporary repair and avoid dismantling of the press. This "temporary" weld had to be made in a vertical position, with the cylinder in place and covering a major part of the break. And it had to be good enough to hold until the press could be dismantled, at some indefinite time in the future.

They certainly expect a lot of a weldor.

There being no alternative, however, the plant weldors started in. Preweld preparation, including flame-cutting of a V-groove and grinding, was similar to the preparation described for the cast-iron induction furnace shell.

Torches were used for the preheat. Two hours of preheat served to bring the casting to the proper temperature for braze welding and also to burn out all the oil that had been soaking into the bed plate during the many years it had been in service.

Welding started at a preheat temperature of 800 F. The weldors used a No. 10 tip (drill size 40). With the base metal at 800 F, heat reflection was a considerable problem.

Two rods at a time were fed into the puddle to fill the large gap more quickly. To speed up the work still more, helpers coated the rods with flux paste before handing them to the men doing the welding. The job required the deposition of 200 lb of ¼-in. low-fuming bronze welding rods. This task, worthy of one of the labors of Hercules, was completed in a single night.

Welding began on the day shift. It was continued without any break by the swing and graveyard shifts until the work was finally finished at three o'clock in the morning. The completed weld was then covered with asbestos paper so that it would not cool too fast. By the time the next day shift arrived, the press was ready for business.

At a later date, when a new cylinder was installed, the portion of the base beneath the old cylinder was fully completed. It was decided not to order a new base because of the production time that would be lost for installation.

WATER PUMP REPAIR

The same rod extrusion press has undergone other braze-welded repairs in the course of its history. Photos 4 and 5 picture repairs at opposite ends of the high-pressure water pump used with the press. The repair shown in photo 4 was made right on the job, without dismantling the pump. Photo 5, taken at a different time, shows a repair being made on the other end of the pump. The braze-welded frame is still in operation after many years of abuse from heavy-duty service.

WILL TAKE SHOCK, TOO

Yes, braze welding can be used to repair parts that are subject to severe shock and impact. Photo 6 provides an example. The part concerned was a steam hammer that had been broken completely through the 6-in. frame and bed. The fracture ran across the middle of the frame and bed at the points where most strain occurs.

This time the metal in the welding groove was removed by air-driven chisels instead of by torches. Then the casting was preheated to 500 F. Smoke began to pour from it. No, the iron was not burning; the smoke came from embedded oil that had soaked into the pores of the metal over years of service. Weldors Fred McEnerney and Patrick Smith waited until the casting had quit smoking before they did anything. Then they checked the preheat temperature with temperature-indicating pellets. Finding it to be at the correct 500 F, they started at the base of the fracture and worked upwards.

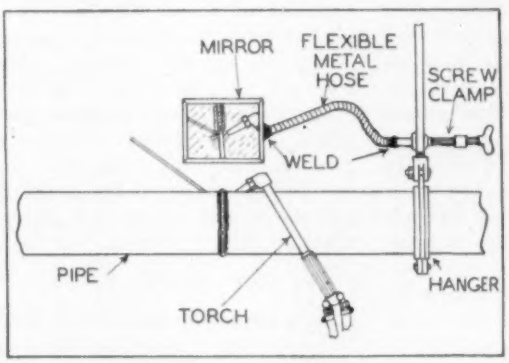
The job required 100 lb of ¼-in. prefluxed bronze rods, and the two weldors completed it in two hours. Since that time, the hammer has been in continuous operation for ten years and has shown no sign of failure.

These six photographs, reproduced through the courtesy of the Bridgeport Brass Co., offer visual proof that a successful repair can be made on heavy sections of cast iron. The recipe calls for low-fuming bronze (brass if you prefer to call it by the correct name). You heat and apply it by the oxyacetylene process, and you must observe due care in: (1) preparing the edges for welding, (2) burning out the embedded oil, (3) preheating to the proper temperature, (4) maintaining preheat temperature during welding and (5) cooling the joint slowly.

Follow this recipe faithfully, and you will be asured of a long-lasting repair.

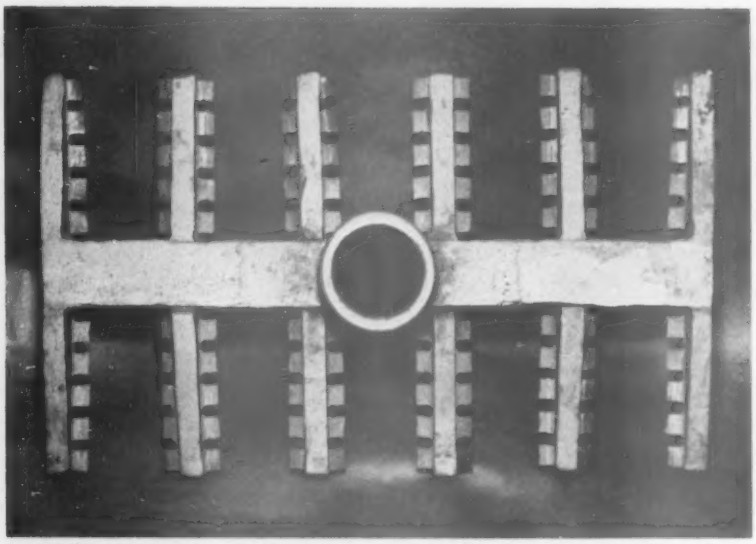
Rear View Welding Mirror

BY THOMAS TRAIL



TO MAKE this rear view mirror, take the flexible metal arm from a discarded desk lamp. Weld or braze a screw clamp at one end to attach to pipe hanger. At opposite end of the flexible arm, join a sheet-metal frame to hold mirror. The mirror should be of shatter-proof glass.

EVER try to weld the opposite side of a pipe when you can't see what you're doing? A handy rear view mirror can be made as shown by above sketch. The mirror should be fitted loosely into the frame so that it will not be broken when the glass becomes heated from welding spatter.



BURNER CASTING of CB-30 will withstand the corrosive action of combustion

HOT-OIL pump plunger of CA-40. End cap is statically cast and is flash welded to a centrifugally cast tube. Flange of 18-8 stainless is arc welded to open end

Here's what you need to know to weld . . .

High-Alloy Castings—I

Welding of castings usually differs from that of wrought materials. This applies doubly to high-alloy castings made for corrosion- and heat-resistant service.

BY { **EARL M. ANGER,** *Chief Metallurgist, The Duraloy Co.*
WILLIAM E. DUNDON, *Foreman, Welding Dept., The Duriron Co.*
GARTH THOMPSON, *Welding Engineer, Michigan Steel Casting Co.*

IMAGINE—if you can—a service temperature of 2,150 F. Some castings must be able to stand up under such terrific heat. Others must withstand long continued corrosive attack from the atmosphere, from hot water or from chemical solutions. What sort of materials will meet these rigorous demands?

The answer is a special group of cast ferrous alloys known generally as the corrosion- and heat-resistant alloys. They are mostly stainless steels, and yet they differ in important respects from the familiar members of the AISI 300 and 400 series. Although castings are available in alloy grades that correspond to all of the familiar wrought compositions (AISI series), the precise chemical ranges differ between the wrought and cast types. Castings, therefore, should be ordered by the cast and not by the wrought designation.

Table I sets forth the standard nomenclature adopted by the Alloy Casting Institute (the technical organization of the high-alloy foundry industry) and accepted by the American Society for Testing Materials and others. The first column of the table gives the cast alloy designation for the most popular grades produced and the second column the nearest wrought alloy equivalent.

Two Main Groups

There are several things that should be known about the alloys listed in this table. To begin with, they are all in the "high-alloy" class; *i.e.*, above 8% in alloy content. They differ from plain-carbon steel and low alloys in thermal conductivity, electrical resistivity, magnetic and other properties. As a result, the welding techniques employed for high-alloy castings are rather different from those for carbon-steel castings. They may also differ from the practices for welding the wrought alloys.

Another thing that is most important is that there are two main groups of cast alloys: those for corrosion resistance and those for heat-resistance. As explained in the footnote at the bottom of Table I, designations with the initial letter "C" indicate alloys used to resist corrosive attack at temperatures less than 1,200 F. Designations with the initial letter "H" indicate the alloys for service where temperatures reach 1,200 F and over.

Each of the designations given in the first column is, in effect, a blueprint of the particular alloy. The second letter of the designation represents the nominal chromium-nickel type, the amount of nickel increasing as you go down the alphabet from "A" to "X." The one- or two-digit number that follows the initial letters indicates the maximum carbon content. If any letters appear after that, they indicate the special elements included in the composition.

Table I. ACI Standard Designations and Chemical Composition Ranges for Heat- and Corrosion-Resistant Castings

CAST ALLOY DESIGNATION	WROUGHT ALLOY TYPE (See Note A)	Composition — per cent							
		C	Mn max.	Si max.	P max.	S max.	Cr	Ni	Other Elements
CA-15	410	0.15 max.	1.00	1.50	0.04	0.04	11.5-14	1 max.	Mo 0.5 max.†
CA-40	420	0.20-0.40	1.00	1.50	0.04	0.04	11.5-14	1 max.	Mo 0.5 max.†
CB-30	431	0.30 max.	1.00	1.00	0.04	0.04	18-22	2 max.	—
CC-50	446	0.50 max.	1.00	1.00	0.04	0.04	26-30	4 max.	—
CE-30	—	0.30 max.	1.50	2.00	0.04	0.04	26-30	8-11	—
CF-8	304	0.08 max.	1.50	2.00	0.04	0.04	18-21	8-11	—
CF-20	302	0.20 max.	1.50	2.00	0.04	0.04	18-21	8-11	—
CF-8M	316	0.08 max.	1.50	1.50	0.04	0.04	18-21	9-12	Mo 2.0-3.0
CF-12M	316	0.12 max.	1.50	1.50	0.04	0.04	18-21	9-12	Mo 2.0-3.0
CF-8C	347	0.08 max.	1.50	2.00	0.04	0.04	18-21	9-12	Cb 8xC min., 1.0 max., or Cb-Ta 10xC min., 1.35 max.
CF-16F	303	0.16 max.	1.50	2.00	0.17	0.04	18-21	9-12	Mo 1.5 max., Se 0.20-0.35
CF-16Fa	303	0.16 max.	1.50	2.00	0.04	0.20-0.40	18-21	9-12	Mo 0.40-0.80
CH-20	309	0.20 max.	1.50	2.00	0.04	0.04	22-26	12-15	—
CK-20	310	0.20 max.	1.50	2.00	0.04	0.04	23-27	19-22	—
CN-7MCu	—	0.07 max.	1.50	*	0.04	0.04	18-22	21-31	Mo-Cu*
HC	446	0.50 max.	1.00	2.00	0.04	0.04	26-30	4 max.	Mo 0.5 max.†
HD	327	0.50 max.	1.50	2.00	0.04	0.04	26-30	4-7	Mo 0.5 max.†
HE	—	0.20-0.50	2.00	2.00	0.04	0.04	26-30	8-11	Mo 0.5 max.†
HF	302B	0.20-0.40	2.00	2.00	0.04	0.04	18-23	8-12	Mo 0.5 max.†
HH	309	0.20-0.50	2.00	2.00	0.04	0.04	24-28	11-14	Mo 0.5 max.† N 0.2 max.
HI	—	0.20-0.50	2.00	2.00	0.04	0.04	26-30	14-18	Mo 0.5 max.†
HK	310	0.20-0.60	2.00	3.00	0.04	0.04	24-28	18-22	Mo 0.5 max.†
HL	—	0.20-0.60	2.00	3.00	0.04	0.04	28-32	18-22	Mo 0.5 max.†
HT	330	0.35-0.75	2.00	2.50	0.04	0.04	13-17	33-37	Mo 0.5 max.†
HU	—	0.35-0.75	2.00	2.50	0.04	0.04	17-21	37-41	Mo 0.5 max.†
HW	—	0.35-0.75	2.00	2.50	0.04	0.04	10-14	58-62	Mo 0.5 max.†
HX	—	0.35-0.75	2.00	2.50	0.04	0.04	15-19	64-68	Mo 0.5 max.†

† Molybdenum not intentionally added.

* There are several proprietary alloy compositions falling within the stated chromium and nickel ranges, and containing varying amounts of silicon, molybdenum and copper. Such alloys are available from licensed producers only.

Designations with the initial letter "C" indicate alloys generally used to resist corrosive attack at temperatures less than 1200° F. Designations with the initial letter "H" indicate alloys generally used under conditions where the metal temperature is in excess of 1200° F. The second letter represents the nominal chromium-nickel type; the nickel content increasing in amount from "A" to "X". For example, "F" stands for the 19%Cr-9%Ni, "K" for the 25%Cr-20% Ni, and "W" for the 12%Cr-60%Ni alloy types. Numerals following the letters indicate the *maximum* carbon content of the corrosion resistant alloys; carbon content may also be designated in the heat resistant grades by following the letters with a numeral to indicate the *midpoint* of a ±0.10% carbon range. If special elements are included in the composition they are indicated by the addition of a letter to the symbol. Thus, "CF-8M" is an alloy for corrosion resistant service, of the molybdenum-containing 19%Cr-9%Ni type with a maximum carbon content of 0.08%.

NOTE A—Wrought alloy type numbers are listed only for the convenience of those who want to determine corresponding wrought and cast grades. Because the cast alloy chemical composition ranges ***are not the same*** as the wrought composition ranges, buyers should use cast alloy designations for proper identification of castings.

NOTE B—Most of the standard grades listed are covered by American Society for Testing Materials specifications A 296-49T and A 297-49T.

Table II. Corrosion-Resistant Alloy Classifications

Straight-Chromium		Chromium-Nickel	
Hardenable	Non-Hardenable	Chromium-Predominant	Nickel-Predominant
CA-15	CB-30	CE-30	CM-25
CA-40	CC-50	CF-8	CN-7MCu
		CF-20	CT-7M
		CF-8M	
		CF-8C	
		CF-16F	
		CH-20	
		CK-20	

COMPLICATED casting of CC-50 is avoided by welding loop casting to top half of casing casting

As an example of what you can learn solely from a designation, consider the cast alloy "CN-7MCu," an alloy for which no counterpart exists in the wrought series. The "C" says that this alloy is primarily for corrosion-resistant service. The "N" suggests that it would be rather high in nickel; actually the nickel content is 21-31%, as we can check in the column headed "Ni." The "7" says maximum carbon content is 0.07%, verified by looking down the third column of the table. The "M" and "Cu" tell us that molybdenum and copper are also present. A rather high content of information, isn't it, to come packed in a capsule of seven characters, including the hyphen?

Corrosion-Resistant Subgroups

Each of the two major divisions of cast high alloys is further divided. Among the corrosion-resistant alloys, two big subdivisions can be made: the straight-chromium and the chromium-nickel alloys. The latter are often referred to as austenitic alloys, and the straight-chromium group as ferritic alloys. A still further division of each group is made, as shown by Table II. The straight-chromium (ferritic) alloys are divided into hardenable and non-hardenable types. The chromium-nickel alloys are divided into chromium-predominant and nickel-predominant types.

The chromium-predominant alloys are often referred to as the austenitic stainless steels. Except for the CE-30 composition, all of the cast compositions in the chromium-predominant group have wrought counterparts (see Table I). The chromium-predominant group includes all of the compositions listed in Table I from CE-30 down through CK-20.

The nickel-predominant group includes the composition CN-7MCu as well as two compositions not shown in Table I: 21% Ni-10% Cr (CM-25) and 35% Ni-15% Cr (CT-7M).

The heat-resistant alloys are similarly divided into straight-chromium and chromium-nickel types. The straight-chromium group is not further subdivided. The chromium-nickel heat-resistant alloys are divided into chromium-predominant and nickel-predominant subgroups. More details will be given in a later installment, when the welding of the heat-resistant alloys is discussed.

Welding Processes

Although all of the common welding methods can be used on high-alloy castings, the metal-arc and oxyacetylene processes are the two most frequently employed. Of these, the metal-arc process is the more common, especially for corrosion-resistant alloys. Oxyacetylene torches are not generally used for corrosion-resistant applications because of the danger of carbon pick-up, a particular hazard with the chromium-nickel alloys. Inert-gas arc welding, including both tungsten-electrode and metal-arc methods, is currently employed on only a small percentage of high-alloy castings. Submerged arc-welding is confined mainly to the fabrication of corrosion-resistant alloys. Resistance welding, including flash welding, is utilized in specialized applications only.

Welding procedures for the high-alloy castings can be divided into the methods that are used for: (1) straight-chromium alloys and (2) chromium-nickel alloys. With minor exceptions, alloys within each of these groups will weld with approximately the same characteristics. The present installment of this article will be confined to the welding of the straight-chromium corrosion-resistant alloys. The second installment will discuss the chromium-nickel corrosion-resistant alloys, while the heat-resistant alloys (both straight-chromium and chromium-nickel) will be deferred to Part III.

Straight-Chromium Alloys

As shown by Table II, the straight-chromium corrosion-resistant alloys include four members: CA-15 and CA-40 in the hardenable and CB-30 and CC-50 in the non-hardenable subdivisions. The CA-type alloys contain from 11½ to 14% chromium, while the CB and CC types contain 18 to 30% chromium. Though both subgroups are referred to as "straight chromium," they also contain some nickel; the maximum nickel content ranges from 1% for the two CA alloys up to 4% for alloy CC-50.

As compared to carbon steel, these straight-chromium alloys show: (*a*) about an equal coefficient of expansion; (*b*) 40 to 50% of steel's thermal conductivity; (*c*) four to six times the electrical resistivity of steel; (*d*) a melting point about 100 F lower. To translate this into practical terms, the alloys expand about the same as carbon steel; they retain heat for longer periods of time and require lower currents for welding.

The corrosion resistance of these alloys comes from their high contents of chromium. As the percentage of chromium in an alloy increases, its resistance to corrosion improves. With increased chromium content, however, greater precautions must be taken to produce a satisfactory weld. The specific precautions necessary will depend, of course, upon the particular properties and characteristics of each alloy.

Hardenable Alloys

The CA alloys, the hardenable types, can be refined in grain size and are hardened by oil- or air-cooling from temperatures of approximately 1,800 F. Since they respond to heat treatment, a wide range of mechanical properties can be obtained by suitable drawing treatments.

When you weld one of these hardenable alloys and allow the weld to cool at a normal rate in air, brittle structures will form in the weld deposit and heat-affected zone. Heat treatment is necessary to impart ductility in the weld and heat-affected zone and to minimize postweld fracture. The tendency to form a martensitic structure in the weld can be partially reduced by adding approximately 0.2% aluminum to the weld metal; this does not prevent structural change in the heat-affected zone of the parent metal, but it does reduce weld brittleness. The aluminum addition can be used, however, only when the product is not subject to a specific hardness specification.

In general, good weldability can

be obtained in the hardenable alloys. When welding is accompanied by the proper heat treatment, good ductility can be obtained in the weld zone, in the parent metal around the weld and in the zone of fusion. Peening and, very often, preheating are necessary precautions in welding these grades, as is true also of the types of having more than 18% chromium.

Non-Hardenable Alloys

The non-hardenable alloys contain 18 to 30% chromium. Though they do not harden when cooled rapidly, the weld areas tend to develop brittleness and grain growth. When the low-carbon straight-chromium alloys with 18% or more of chromium are heated to the high temperatures that welding demands, they are subject to rapid grain growth, particularly if the nitrogen content is low. Furthermore, these alloys do not respond satisfactorily to grain-refining heat treatments. Composition of the parent metal and composition of the weld-metal deposit are important factors in controlling grain size.

The non-hardenable alloys usually have limited weldability. Even so, you can get a good weld if you exercise extreme care in welding and if the nickel content is close to the maximum allowable in the specifications for these grades.

Preheating Requirements

When the welding arc is applied to a straight-chromium alloy, there results a fairly localized area of intense heat. This tends to expand the molten metal against the colder surrounding metal, causing warping or distortion. The heat of welding also tends to enlarge the grains next to the weld area. When the arc is broken, the welded area will start to cool and contract, applying another force on the metal. Unless the metal has enough ductility to absorb these stresses, it will crack.

How do you eliminate these high stresses? It's done by preheat. The straight-chromium alloys should be preheated, generally from 350 to 800 F. Table III shows common preheating treatments that are applied to each of the four alloys in the straight-chromium group. As a further precaution to prevent cracking, it is advisable to weld all straight-chromium corrosion-resistant alloys in the annealed condition and not in the as-cast condition.

Table III. Preweld and Postweld Heat Treatments

Alloy	Before Welding	After Welding
CA-15	400 to 600 F	Cool to not less than 300 F, heat to 1,125-1,400 F, hold*, then air cool.
CA-40	400 to 600 F	Cool to not less than 300 F, heat to 1,125-1,400 F, hold*, then air cool.
CB-30	600 to 800 F	Cool to 150 F or lower; then heat to 1,450 F, hold*, then air cool.
CC-50	350 to 400 F	Heat to 1,650 F, hold*, then rapidly air cool.

*Time at postheat treatment temperature should be sufficiently long to insure uniform heating throughout the area and section involved.

Table IV. Electrical Settings and Electrode Size

Thickness, in.	Electrode Diameter, in.	Amperes	Volts
Under 1/16	5/64	25 - 50	20 - 22
1/16 - 9/64	3/32 or 1/8	50 - 90	22 - 24
9/64 - 3/16	1/8 or 5/32	90 - 125	22 - 24
3/16 - 1/2	5/32 or 3/16	100 - 150	23 - 27
1/2 and above	3/16	125 - 175	26 - 29

The straight-chromium alloys also include some with higher carbon that are not shown in Table I. These alloys are for abrasion-resistant service and are more difficult to weld than the CA-15, CB-30 and CC-50 types.

The alloy compositions with high carbon may contain 12 to 18% chromium with 0.60 to 1.10% carbon; they are air-hardenable and can be welded at a red heat. After welding, they should be heat treated to obtain the required hardness and to prevent a highly martensitic structure.

In considering preheat treatments for all of the straight-chromium grades, the expected service and fabrication after welding should be kept in mind. If, for instance, straightening after welding is necessary, a preheat is a must.

Welding Techniques

The majority of corrosion-resistant castings are welded by the manual metal-arc method. Because of the greater electrical resistance and lower melting point, welding can be accomplished with much lower electrical currents than are used for plain-carbon steel—not over 175 amp, even for 1/2-in. thickness.

Direct current is most commonly used for welding these alloys, although alternating current can also be employed. With direct current, reverse polarity is recommended. Good control can be achieved by maintaining a short arc and using as low a current as possible.

Recommended electrical settings and electrode sizes for various section thicknesses of straight-chromium corrosion-resistant cast parts are shown in Table IV. The voltage settings indicated are measurements taken between the arc and the ground under conditions of actual welding. The amperage and voltage are recommended settings for welding in the flat position. If welding is accomplished at an angle, the amperage required decreases as the angle increases; this is progressive and reaches a minimum at the 45 deg position, where only about 70% of the amperage in the table is required.

Weld defects in straight-chromium alloy castings are seldom caused by the position of the weldment. It is common practice to weld castings in the flat position. There seems to be

only slight, if any, advantage in welding at an angle, other than increased accessibility of irregular parts. Some slight advantage may occasionally be gained by welding at an angle of about 15 deg, and successful welding has been accomplished at many other angles such as 22 and 45 deg.

In selecting the proper electrode, it is extremely important that the weld metal have the same corrosion-resistant properties as the parent metal. If you are welding a CA or CB type, use rod of approximately corresponding compositions. This brings in a complication since electrodes are sold by AISI type numbers. A type 410 or 416 electrode would be selected for a CA-15 grade, and a type 430 rod would be selected for the CB-30 alloy (consult Table I). These electrodes are used when the welding is followed by heat treatment—annealing, or normalizing and drawing.

Chromium-nickel electrodes are not often used to weld straight-chromium alloys. The nickel added to the weld metal will form hard spots that cannot be eliminated by heat treatment. Straight-chromium electrodes free from nickel are usually recommended on all straight-chromium alloys containing up to 22% chromium. Some nickel can be present when welding CC-50 (28% chromium).

If a chromium-nickel electrode can be tolerated, an electrode of 25% Cr—20% Ni analysis (type 310) is often used to increase weld ductility. Caution must be exercised to select an electrode of sufficient chromium content; also one having approximately the same coefficient of expansion. Although there are many applications in which this practice is feasible and desirable, it is not a cure-all for the cracking of straight-chromium alloys. Other factors, such as the operating temperature and the effect of the service on the nickel content of the electrode, must be considered.

Lime-coated (low-hydrogen) electrodes are usual for welding the straight-chromium alloys as they allow the operator to build up a bead much more satisfactorily than a titania or titania-lime coated rod. In welding the CA-15 alloy, it is sometimes an advantage to spray aluminum or silicon powder on the outside of the coated rod; this is an aid in deoxidation.

It is possible to weld both the CA and CB alloys with a type 446 (28% chromium) electrode and still produce a machinable weld, providing that a rod of less than 1/8 in. in diameter is used and welding is done with as low an amperage as possible. The 446 electrode is feasible only when specifications do not call for a prescribed heat treatment to meet specified physical properties.

You can control grain size, in welding the straight-chromium corrosion-resistant alloys, by laying small beads and keeping the heat input low. Numerous small beads are definitely preferred to fewer but larger beads. It is also considered desirable to peen after every bead.

The overwhelming majority of corrosion-resistant straight-chromium castings are welded by the manual metal-arc method. The inert-gas metal-arc method produces welds of smoother surface, but it has not yet come into its own.

Postweld Heat Treatment

Heat treatment after welding is a must to impart desirable physical characteristics to welded straight-chromium alloys. Brittleness in the weld zone can be reduced and ductility improved by an annealing treatment, the nature of which depends on the chemical analysis of the alloy.

Some suggested postweld heat treatments are given in the right-hand column of Table III. Frequently used annealing temperatures are: 1,400 F for the CA-15 and CA-40 hardenable compositions; 1,450 F for the CB-30 (non-hardenable); and 1,650 F for the CC-50 (non-hardenable). In the case of the CA-15 alloy, the annealing treatment will temper the martensitic structure. With the CB-30 and CC-50 ferritic alloys, the annealing treatment will relieve the welding stresses and thus prevent cracking.

In the postweld heat treatment, the welded parts should be held at the required temperature for sufficient time to insure uniform heating throughout the area and section involved. It is usually advisable to heat the entire casting.

Chromium-Nickel Alloys

The chromium-nickel alloys are usually somewhat easier to weld than the straight-chromium types, but different treatments must be considered. These treatments will be discussed in Part II, to be published in an early issue of The Welding Engineer.

UNDERFRAMES

(Continued from page 41)

This is done in one of two upside-down jigs. After the parts have been tack welded, the assembly is turned over for tack welding of the bolster top cover plate.

Photo 7 shows the end of 50-ft auto box car underframe after completion of main assembly tack welding. Bolster top cover plate is at the right of this picture. Assembled to the center sill "backbone," which runs diagonally from background to foreground in the picture, are the bolster, stringer and crossbearer; parallel to the center sill are longitudinal stringers and side sills. Other parts include a fabricated striker plate, center steel castings and drop-forged draft gear stops (at each end). The total weight of such an assembly runs 7,500 and 8,300 lb for 40-ft cars, close to 14,000 lb for 50-ft cars.

The tack-welded underframe is carried by five-ton hoist to the rotary positioner where it receives its final downhand welding. There are seven such rotary positioners, four of which are shown in photo 8. These positioners are operated by air motors.

The finished underframes are carried out into another yard, at the west end of the building, where the members are checked for straightness and proper camber and inspected for any defects. They are then painted and loaded for shipment. Two of the customer railroads provide flat cars equipped with special stanchions having wood-lined steel channels. The frame ends fit snugly into these wood-lined pockets, and no other attachment is required.

Under average production, about 12 underframes are completed daily in an 8-hour shift. Electrodes (principally E-6012) are consumed in large amounts. Under normal production, operating eight hours a day, close to three tons of rod are used each week.

The operations illustrated and described in this article are those that take place in two buildings and in a paved yard between them at the Maywood plant. Currently in use in the welding building are about 85 arc welders, mostly a-c, lined up along the north and south walls. About 25 of these are 400-amp welders used for tack welding; the rest are 500-amp welders.

Brazing as a Production Medium

PART TWO

How to Braze { Aluminum Alloys; Copper-Base Alloys; Carbon Steels; Stainless Steels; High-Nickel Alloys }

BY LESTER F. SPENCER
Chief Metallurgist, Landers, Frary & Clark, New Britain, Conn.

Brazing is quite versatile. In order to utilize it effectively as a production medium, however, it is essential to answer such questions as:

What are the characteristics of the metal or metals to be joined? In particular, how does the metal behave under the influence of heat?

With the materials specified for brazing, what are the conditions under which a satisfactory brazed joint can be made?

What methods are available for the assembly of component parts? What are the advantages and limitations of each method?

What are the characteristics of the brazing alloy to be employed?

In Part I of this article, published in the March, 1953, issue of THE WELDING ENGINEER, *Mr. Spencer discussed brazing strength vs. clearance and the selection of brazing alloys and fluxes. He also described the six brazing methods that are today available for production applications: torch brazing, resistance brazing, incandescent brazing, induction heating, salt bath and controlled-atmosphere furnace.*

The present installment takes up the problems pertaining to specific types of materials to be brazed: aluminum alloys, copper-base alloys, carbon steels, stainless steels and high-nickel alloys. Helpful hints are also given on joint design and on methods for supporting the assemblies prior to and during brazing.

If you want to know how to braze it, here's information you need. We think that Mr. Spencer has done a fine job of compiling it for you.

—The Editors

Aluminum Alloys

THE WROUGHT aluminum alloys can be divided into two groups: (*a*) those that are heat-treatable and (*b*) those that do not respond to heat treatment. Within the heat-treatable group, alloys 53S, 61S and Nos. 21 and 22 brazing sheet can be successfully brazed; the assemblies are quenched directly after brazing provided quenching is permitted by design. The copper-type aluminum alloys such as 11S, 14S, 17S and 24S are not usually brazed because of the loss of both corrosion resistance and mechanical properties within the brazed joint.

Of non-heat-treatable alloys, 2S and 3S are the only types that are used for brazing. When these alloys are to be brazed, the design strength should be the strength of the annealed material. The alloys containing magnesium, such as 52S and 56S, have a very tough and resistant oxide film. This makes them ordinarily unsatisfactory for brazing; however, they can be brazed by special procedures.

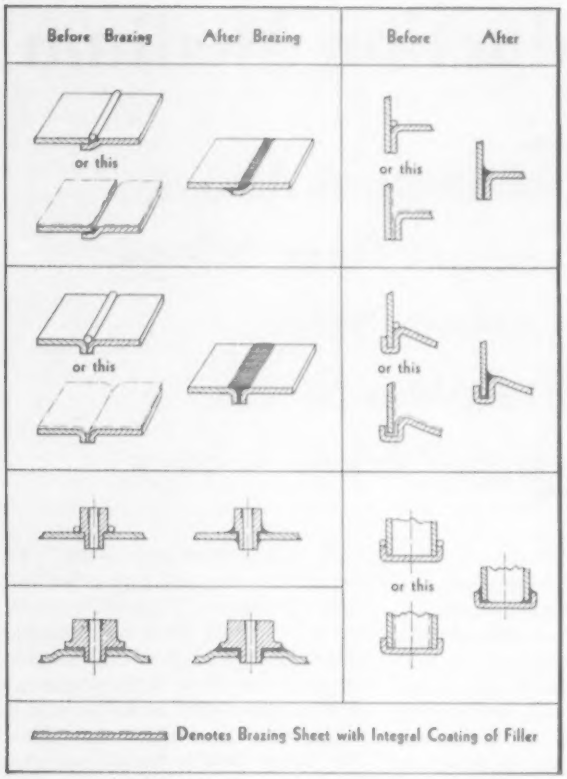
Brazing materials for aluminum alloys are given in Table I; the choice of filler rod will be governed by the particular alloy. The form employed may be either shim stock or wire, the latter being used to a considerable ex-

Table I. Brazing Materials for Aluminum*

Material being brazed	Filler material	Form	Uses
2S or 3S	No. 716 brazing wire	Wire and shims	General use
	43S	Wire	Limited use—torch brazing only.
4S or 52S	No. 716 brazing wire	Wire and shims	Limited use. Short joints—torch brazing only.
53S, 61S or 63S	No. 716 brazing wire	Wire and shims	General use
No. 1 or 2 brazing sheet	No. 716 brazing wire	Wire and shims	General use
	No. 711 brazing sheet†	Shims	
	43S	Wire	Limited use—torch brazing only
No. 11 or 12 brazing sheet	No. 716 brazing wire	Wire and Shims	General use
	No. 713 brazing sheet†	Shims	
No. 21 or 22 brazing sheet	No. 716 brazing wire	Wire and Shims	General use
	No. 713 brazing sheet†	Shims	

Courtesy Aluminum Co. of America

*Identification numbers are those of Alcoa alloys. †Same composition as brazing coating.



1—SOME typical joints for brazing aluminum alloys, as recommended in the handbook, "Welding and Brazing Aluminum," published by the Aluminum Co. of America.

tent in torch brazing. Brazing sheet can also be employed. In this type of product, the filler metal is bonded on either one or both sides of the sheet, and brazing can be performed without the addition of other filler material. The thickness of this filler coating is between 5 and 10% of the total sheet thickness.

Fluxing is required in aluminum brazing; the specific type and method of application of aluminum fluxes can be obtained from the Aluminum Company of America's booklet, "Welding and Brazing Aluminum."

Designs for joints that are to be furnace brazed should not include parts any thicker than ½ in. or thinner than 0.006 in. It is best not to design furnace-brazed joints having a wide range in thickness because of the varying rate of temperature rise that occurs with parts of uneven section. In order to obtain uniform brazes with multiple parts, it is recommended that forced-circulation furnace design be employed. The temperature should be controllable to within ± 5 F within the acceptable operating range of 1,000 to 1,200 F. It may also be necessary to provide for the insertion of baffles so that radiant energy from the heating units does not produce localized overheating. Radiant heating is not acceptable where assemblies such as fin condensers or radiators are to be joined by brazing since they do not absorb radiant heat evenly; the more accepted method in these instances is convection heat. In instances where the entire assembly can be uniformly exposed, radiant heating does an exceptional job. An excellent example is the brazing of aluminum evaporator pans.

Torch brazing of alloys 2S, 3S, 4S, 52S, 53S and 61S can be performed successfully, but torch brazing is not recommended for alloys 11S, 14S, 24S or 56S. Where torch brazing can be employed, both the oxyhydrogen and the oxyacetylene flames are used, depending upon the thickness of material.

Dip brazing can be used on aluminum assemblies designed so that complete drainage of salt can be realized after immersion. The same range of temperature (1,000-1,200 F) is employed, and the time of immersion in the molten bath will vary from 30 seconds to 3 minutes, depending upon both the shape and the thickness of the part. One precaution to observe is that the bath be dehydrated; otherwise, the aluminum assembly will be attacked during immersion. A method of dehydrating a molten bath is to dip a piece of scrap aluminum sheet into the flux. As long as moisture is present, hydrogen is evolved, which ignites on the surface and produces small orange flames.

Thorough cleaning of aluminum parts to be brazed is essential. The brazing flux should also be removed as soon as brazing has been completed; this is especially necessary where the more corrosive fluxing mediums are employed.

Typical joint designs for aluminum brazing are indicated in Fig. 1: the lock seam, tee, line contact or lap joints are preferred over either butt or scarf joint design. Clearances will vary with joint design; in any specific case, experimental work is usually required to establish the proper clearance. Usually, from 0.006 to 0.010 in. is suitable for laps less than ¼ in. long; clearance up to 0.025 in. may be employed on longer laps. The design should permit easy assembly before brazing, and closed assemblies should be designed to allow gases to escape, especially where furnace brazing is involved.

Copper-Base Alloys

The alloys within the copper-base group can be joined by the use of either a silver-bearing brazing alloy or by the self-fluxing copper-phosphorus alloy. The heat conductivity of those alloys that have a high copper content is comparatively high so that a greater heat input is usually required to obtain a good braze. In the brazing of brass, volatilization of zinc may occur; however, some degree of protection can be obtained by placing a copper plate on the item prior to brazing. In the event that heavy and light sections are to be joined, more heat should be placed in the heavier section so that simultaneous brazing in both sections can be realized.

Radiant burner and induction heating can be employed to braze these materials. The advantages of these methods are that the brazed joint is visible and that localized heating may be effected. Copper-base alloys can also be brazed quite successfully in an atmosphere-furnace without prior fluxing provided that the brazing alloy is free of either zinc or cadmium. Resistance and salt-bath brazing are limited to individual de-

signs; however, these methods make excellent joints when applicable.

Such alloys as yellow brass and nickel silver may stress crack upon localized heating; this has been experienced by the author on drawn shells that had previously had a high degree of cold work. In the brazing of nickel silver that had previously been spun, stress cracking occurred upon torch brazing. The remedy was a localized preheat of the areas to be subsequently exposed to the heat of brazing. The stress-relief temperature found to be of advantage was approximately 600 F, held for ½ to 1 hour.

Carbon Steels

No difficulties will be experienced in the brazing of either low-carbon or high-carbon steels, providing that the brazing alloy is not of the type containing phosphorus. The use of a protective atmosphere is a prerequisite in furnace-brazing technique; the higher carbon steels require a protective atmosphere having a dew-point of —40 F in order to prevent decarburization from occurring in the base metal. The low-carbon steels are frequently brazed in sheet-metal work, utilizing all types of brazing methods.

In the brazing of steel components, a silver or copper brazing alloy containing phosphorus is not recommended because of the chance of embrittlement and decrease of joint strength.

Where copper is used as the brazing alloy, the high temperature needed (around 2,050 F) will cause some grain growth to occur in the base metal. Should this be objectionable, a remedial heat treatment can be given without affecting the brazed joint. Silver alloys do not require such high temperatures and result in equally strong joints.

Stainless Steels

The austenitic stainless steels are quite easily brazed. The most common alloy within this group that we braze at Landers, Frary & Clark is type 302 or "18-8" stainless. A silver-base filler rod is usually employed. The most difficult alloy to braze within the austenitic group is the free-machining 18-8, type 303, which contains phosphorus. The ferritic or straight-chromium stainless steels, such as type 430, are also difficult to braze. The lack of success in brazing type 430 stainless steel has led to the wide usage of inert-arc welding for this composition. However, there is considerable investigation in progress on the brazing of type 430, and it may not be too long before we will know how to braze this material successfully.

Torch brazing is used to a considerable extent in the joining of the austenitic stainless steels, and the most frequently employed brazing alloys are those having a silver base. The temperature for silver brazing is within the carbide precipitation zone of 800 to 1,500 F, so the brazing operation must be performed in a short time. A lengthy time within the 800-1,500 F range permits the formation of harmful carbides, which will adversely affect the corrosion resistance of the parent metal. For this reason, many steel producers frown on the brazing of type 302 stainless steel. Brazing is perfectly satisfactory, however, for the stabilizing grades, types 347 and 321, which will retain maximum corrosion resistance regardless of either temperature or time factors.

We have minimized the formation of carbides in type 302 at Landers, Frary and Clark by the use of induction heating followed by a water quench. On light-gage stainless, induction heating is very rapid, thus minimizing the time within the carbide-precipitation zone. Then the water quench quickly cools the material to past the lower critical temperature of 800 F. Unfortunately, the method cannot be followed for all types of designs because distortion may be experienced.

The condition of the stainless prior to brazing is important; we have previously mentioned possible stress cracking of cold-worked material. If carbides are present prior to brazing, a stress-corrosion cracking may be experienced from the combined action of heat and corrosion from the brazing flux.

For silver brazing of stainless steel, the types of joints that are used most successfully are the butt, scarf and lap joints. Again, the strength of the joint is proportional to the clearance provided within the joint; the joint clearance should preferably be between 0.001 and 0.003 in. Here, also, a clean joint is absolutely essential; contamination of the area will not only result in poor strength, but will also reduce corrosion resistance.

Furnace brazing of an austenitic stainless can utilize an atmosphere of either dry, pure hydrogen or dissociated ammonia, the latter being the most widely used. Such an atmosphere is quite costly, but it is often justified where difficult and intricate assemblies are encountered. One example is a closed container having a ¼-in. vent hole. Without the proper atmosphere, furnace brazing resulted in scale formations, which caused difficulties in subsequent pickling and in the removal of acid traces from the inside of the container.

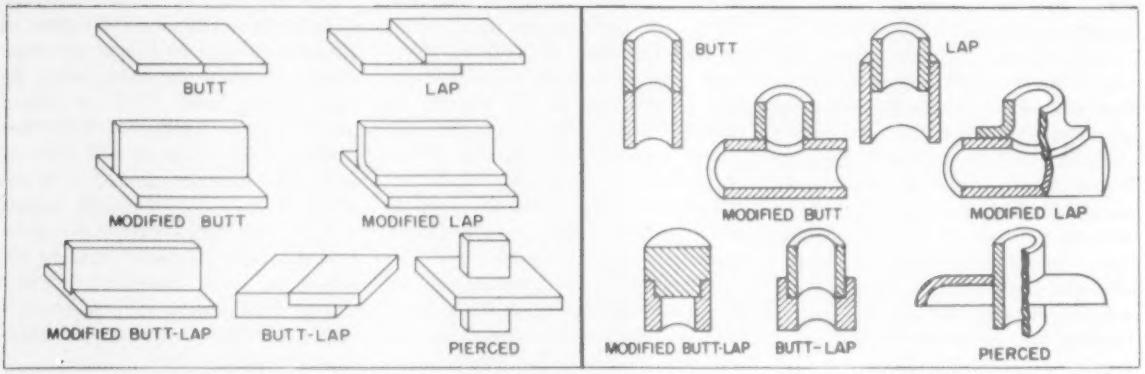
All of the brazing methods described in Part I are applicable to the brazing of the stainless steels, but the choice of method should be in accordance with the specific design and the end use of the product. A preplaced alloy is definitely of advantage in all methods but torch brazing.

High-Nickel Alloys

In the joining of such high-nickel alloy materials as Inconel, Monel and nickel, a silver alloy of low melting point is preferred. Especially is this true in the brazing of Monel, which is subject to intergranular attack by molten brazing alloys above 1,400 F. To braze Monel successfully, a silver-brazing alloy must be selected that will melt at 1,200 F or lower. As is the case with steel, a brazing alloy containing phosphorus is not recommended. Because the brazing temperature used for the high-nickel alloys is normally below their annealing temperatures, brazing will cause very little softening. Heat-treated "K" Monel or "Z" nickel, for example, can be silver brazed with but slight softening. Age-hardening treatments can also be performed on these two nickel alloys after silver brazing has been completed.

Brazing of the high-nickel alloys can be done by any of the methods previously mentioned. In torch brazing, a neutral or slightly reducing flame is employed. Should it be desirable to restrict the area to be wetted by the brazing alloy, a "stop-off" paste can be employed. This paste consists of graphite and sodium silicate mixed to a thick consistency. It can easily be removed after brazing.

The high-nickel alloys are susceptible to sulphur embrittlement, and suitable precautions must be taken to remove traces of this harmful element in the furnace atmosphere or within



Courtesy Handy and Harman, N. Y.

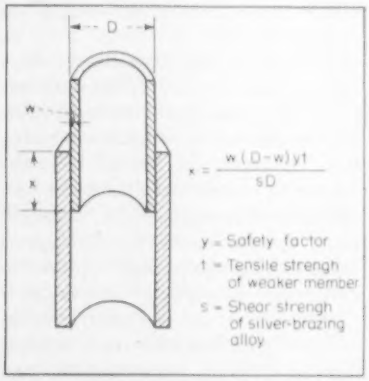
2—DESIGNS for brazed joints—flat and curved surfaces. Basically, there are only two types of joints: butt and lap

the salt bath. Small traces of sulphur can be removed from the salt bath by the suspension of either scrap sheets of nickel alloy or nickel turnings for a period of approximately two hours at the brazing temperature to be employed.

Lap joints are preferred over butt joints for the high-nickel alloys since better alignment is realized. The clearances are similar to those recommended for the stainless steels.

Joint Design

Proper joint design is largely a question of using the right type of joint and providing the correct clearances. The subject of clearances has been mentioned often, but clearance cannot be stressed too much. In silver brazing as well as in the brazing utilizing other types of filler metal, it is generally true that the thinner films of brazed metal provide the stronger joints. In the joining of metals that have different coefficients of expansion, the clearance may alter either way.



3—FORMULA for finding depth of lap, *x*, to get best results in the silver brazing of tubular joints

The two basic types of joint are: (1) butt and (2) lap. Modifications of each type, either singly or in combination, encompass all joint designs.

The butt joint is used where the double thickness of a lap joint is undesirable. Modified butt joints (see Fig. 2) offer many advantages for the joining of either flat or tubular members. To obtain the best results with any type of butt joint, a few simple precautions should be taken. First, joint surfaces (unless scarfed) should be square and parallel to assure proper alignment and to give a uniform clearance over the entire joint area. Parts should be held firmly during brazing.

Scarf joints are modifications of a butt joint; the joint surfaces are cut at an angle of less than 90 deg. These joints give high strength values without objectionable increased thickness.

The lap joint, also called a "shear" joint, is considered as the most satisfactory for brazing. The lap or shear area can be varied to meet any desired factor of safety, and joints can be held in place readily. In joining flat parts, a little pressure (easily applied) assures complete bonding. On tubular joints where pressure cannot be applied, it is important that correct tolerances be employed in the initial design. A good rule-of-thumb formula, giving an ample factor of safety for most purposes, is to use a lap three times the thickness of the thinnest joint member. A method given by Handy & Harman for calculation of the desired lap is diagrammed in Fig. 3.

The formula for tubular joints is:

$$x = \frac{w(D - w)yt}{sD}$$

where:

x is the depth of lap or shear.

w is wall thickness of weaker member.

D is diameter of shear area.

y is the factory of safety.

t is the tensile strength of weaker member.

s is the shear strength of the silver-brazing alloy.

Example: What depth of lap is required to join ¾-in. copper tubes having 0.064-in. wall thickness to ¾-in. steel tube sheets?

w = 0.064 in. D = 0.75 in.

D — w = 0.75 — 0.064 = 0.686 in.

t = 33,000 psi (tensile strength of annealed copper)

y = 5 (A smaller factor of safety would be satisfactory if, for some reason, the length of the lap were limited.)

s = 25,000 psi (This is a value which can be expected from alloys containing appreciable amounts of silver.)

Then:

$$x = \frac{0.064 \times 0.686 \times 5 \times 33{,}000}{25{,}000 \times 0.75}$$

= 0.386-in. lap

For flat joints, the formula is modified to:

$$x = \frac{ytw}{s}$$

Where the values of x, w, y and s mean the same as in the formula for tubular joints.

Example: What length of lap is necessary to join 0.050-in. annealed Monel sheet to a metal of equal or greater strength?

y = 4 w = 0.050 in.

t = 70,000 psi (annealed Monel sheet)

s = 25,000 psi

Then:

$$x = \frac{4 \times 70{,}000 \times 0.050}{25{,}000}$$

= 0.56-in. lap

Methods of Staking

Where the entire assembly is to be subjected to brazing heat as in furnace or salt brazing, the method of supporting each individual assembly during brazing becomes important. Several suggested methods for the support of assemblies to be electric furnace brazed are given by Webber. A few of these methods are illustrated in Fig. 4.

Thus a press fit (B), staked fits, tack or spot welding, swaging (A), crimping (E), spinning, expanding, (C), peening (G), interlocking joints (D), pins or screws (F) are examples of methods used in supporting assemblies for furnace brazing. As this subject is too broad to cover in much detail in this article, it is recommended that the original reference* be examined.

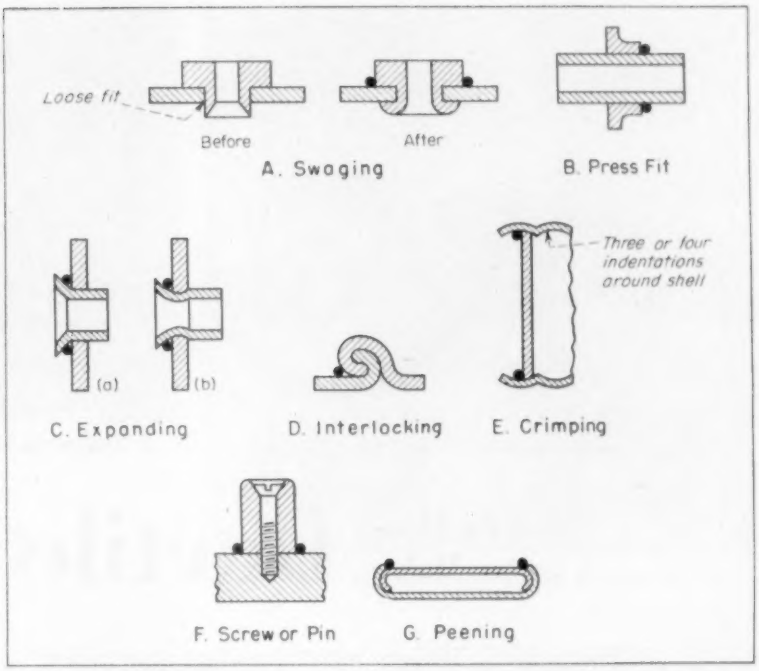
Of interest is the method of bonding brackets to a refrigerator shell as illustrated in Figs. 5 and 6. In Fig. 5, wire cut into slugs is used to bond the brackets (previously projection welded to the shell) to gain extra strength. When the brackets are stamped, they are formed with lips at the top to provide recesses for the slugs, shown in position in Fig. 6. They are positioned easily and inexpensively by the operator and the recesses form good reservoirs for the molten brazing metal. The spuds in the shell, also illustrated in Fig. 6, are provided with shoulders on which copper rings were placed.

In conclusion, the selection of brazing process, brazing alloy and flux, clearances, type of joint, joint preparation and cleaning procedure is essentially an individual problem. The determining factors are the material to be brazed, the end use of the brazed item and qualities such as the degree of strength desired in the joint, corrosion resistance expected, etc. Should individual experiences with brazing be limited, it might be well to experiment within the plant. In all cases, consult the suppliers of equipment or materials in regard to brazing technique. In many instances, either the supplier of the parent metal or of the filler rod can aid considerably. The drawings accompanying this article constitute an example of the aid that can be furnished.

The selection of a furnace to perform brazing is difficult. It is best to compare all types of equipment on the basis of design, weight, shape and size of the brazed part, production economies, maintenance and initial cost. Production requirements per hour, versatility of equipment, floor space available, possibility of combining operations with brazing, etc., must also be considered. The most logical aid on this subject will be obtained from the furnace manufacturer; in many instances, manufacturers can furnish three or four methods to choose between.

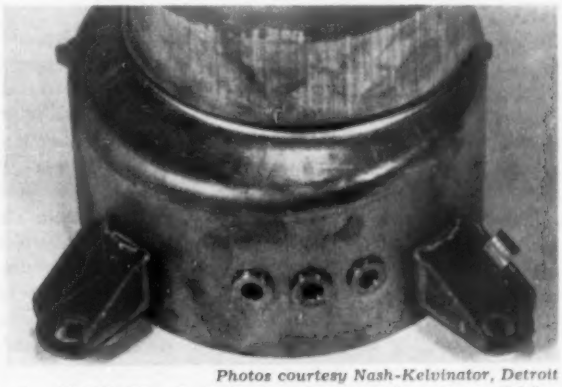
The End

*"How and Where to Use Electric Furnace Brazing," H. M. Webber, General Electric Co., Schenectady, N. Y. (catalog number: GE3193C)



4—METHOD of supporting the assembly is important to furnace or salt-bath brazing. Here are several different ways of holding parts together

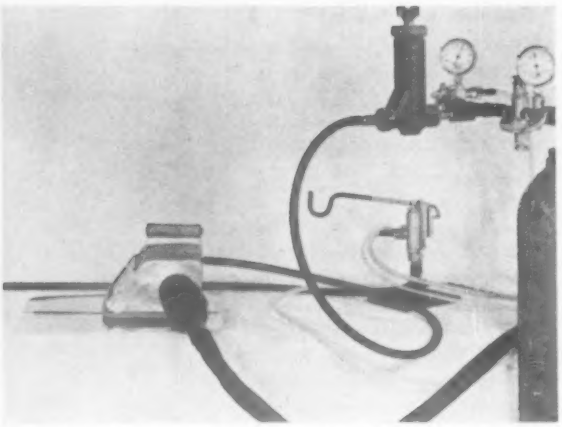
5—WIRE slugs bond brackets (previously projection welded to shell) in order to gain additional strength



Photos courtesy Nash-Kelvinator, Detroit

6—CLOSE-UP of shell shows the pockets into which the slugs of copper wire are dropped before brazing

1—FIRST box designed for welding zirconium sheet



2—HOOD for welding seams in flat sheet or tanks

*Here's How to Make Ductile Welds in

Zirconium is actually more abundant than nickel or copper, but the difficulties created by its affinity for atmospheric gases have retarded large-scale production until recently. Many applications are foreseen for it.

BY F. G. COX, B. Sc., Ph. D., A.R.C.S. D.I.C.

THE MOST promising commercial property of zirconium is its high resistance to corrosion. It will stand up under attack from hydrochloric and nitric acids in all concentrations, dilute sulphuric acid, most organic acids and the alkalis. There ought to be many jobs for a metal like that, but unfortunately there are difficulties.

Zirconium is usually regarded as brittle. However, it has been produced in a ductile form for the last few decades. The main difficulty is that zirconium has an enormous affinity for all the common gases of the atmosphere. It is, in fact, stable at elevated temperatures only in the presence of the truly inert gases—helium, neon, argon, krypton and the other members of Group O of the Periodic Table.

The affinity of zirconium for oxygen and nitrogen has naturally retarded production. Hot forging and hot rolling must be done in a mild-steel sheath; annealing has to be carried out in a vacuum or in an atmosphere of pure inert gas. Only recently has large-scale production been achieved. And fusion welding without loss of ductility has hitherto been considered impossible. Satisfactory welds can be made by spot and seam welding, but this does not cover all requirements. Hence this investigation was undertaken to discover, if possible, a fusion process by which ductile welds could be made in zirconium.

Inert Atmosphere Required

The conditions under which a metal is melted during manufacture usually bear some relation to the conditions under which it can be welded. In the production of zirconium in the form of cast ingots, the metal is melted under a vacuum of the order of 1 micron. While such a vacuum could be maintained in a suitable furnace, it would be impracticable, if not impossible, to maintain it under fusion welding conditions. However, ductile zirconium can be produced by melting it in an arc furnace in an atmosphere of pure argon. It should be possible, it was reasoned, to weld zirconium in an atmosphere of argon.

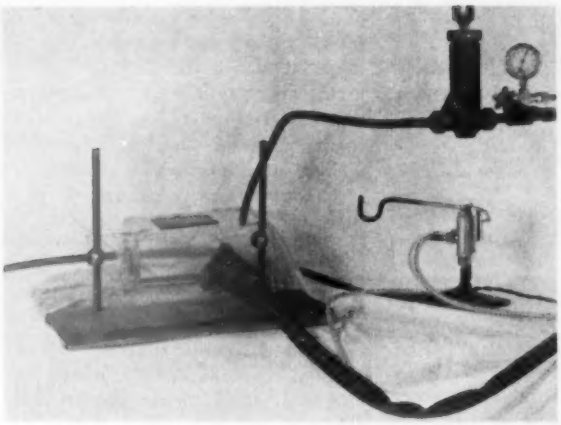
A process has been developed since 1930 for arc welding in an atmosphere of inert gas, either helium or argon. In America, helium occurs in some natural gases in concentrations that permit economic extraction. In this country (England), argon is generally used as the shielding gas for welding because it is the most abundant inert gas in the atomosphere. Equipment for argon-arc welding, being readily available and widely used, became the obvious choice for welding zirconium. Some modifications were necessary, however.

Experimental Conditions

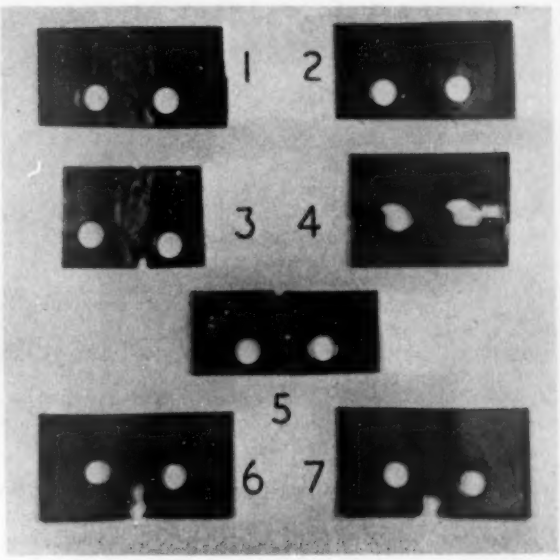
A standard type of inert-arc electrode holder designed to carry up to 300 amp was used throughout the experiments. This comprises a tungsten electrode mounted in an adjustable brass collet. The electrode is enclosed by a ceramic cup, which is interchangeable to suit the size of electrode. The welding current is supplied through a water-cooled copper cable, and the whole of the electrode is water cooled. Current supply for a-c welds was taken from a standard welding transformer; for d-c welds it was taken from a welding generator.

Argon of standard welding quality was used for all the welds; it was described as not less than 99.80% pure, but the purity was not checked.

*Abstract of an article in the *Murex Review*, published by Murex Ltd., Rainham, Essex, England.



3—LATEST hood for welding shapes of moderate size



4—TEST pieces after immersion in a corrosive bath

Zirconium

At the outset of the experiment, absolutely pure argon was believed essential to insure ductile welds, but it was decided not to treat nor purify the gas in any way. The test results indicate that ductile welds can be made in zirconium up to a certain thickness by using standard welding quality argon as a shield. The argon was taken from several cylinders to eliminate the possibility of any one cylinder containing a gas of exceptional purity.

Apart from one or two special cases, the welds were made on zirconium sheets of 0.030 in. and 0.060 in. thickness. Both sizes were welded with simple butt joints; the 0.030-in. sheet without filler rod and without edge preparation apart from insuring straight edges. In the case of the thicker sheets, the edges were chamfered to 45 deg, and zirconium wire of 0.050-in. diameter was employed as a filler rod. The filler rod was carefully cleaned before use by rubbing it with emery cloth to remove all traces of oxide film and drawing lubricant.

For the d-c welds, the electrode was coupled to the negative pole of the current supply (straight polarity). Welding with reverse polarity was impracticable as the tungsten electrode tended to melt. Welding currents were: 45 amp (0.030-in. sheet) and 55 amp (0.060-in. sheet). The open-circuit voltage was 60, falling to 25 volts when the arc was struck.

For a-c welds, the current was 55 amp for the 0.030-in. and 65 amp for the 0.060-in. sheet. In both cases, the open-circuit voltage was 100 volts.

A special jig was made to hold the sheets in position. Each sheet was clamped to a piece of ¼-in. steel plate so that the edges to be welded extended slightly beyond the plates. The plates were then clamped to a larger plate in a manner that allowed the edges of the zirconium sheets to touch accurately. These precautions were taken to avoid contamination of the weld by iron.

The width of the gap between steel plates controlled the extent of the heat-affected zone. The most satisfactory widths were ¼ in. for the 0.030-in. sheet and ⅜ in. for the 0.060-in. section and thicker. A stream of argon was directed through the opening under the joint to protect the back of the weld. The argon stream at the back of the weld was dispensed with when welds were made in the enclosed box to be later described.

To avoid contamination of the weld with tungsten from the electrode, the arc was struck on the extreme edge of the sheet to be welded, and this portion was trimmed off after welding. No difficulty was experienced in maintaining a steady arc even without high-frequency stabilization. Experimental welds were made to ascertain the embrittlement in the welds and to examine the reported difference in welds made with direct and alternating current.

Tests using alternating current showed that variations in the flow of argon up to 50 cu ft per hour had no effect on the brittleness of the weld. At higher flow rates, the arc was unstable and welding became impossible. On thin sheets, direct current showed marked improvement: ductile welds were obtained with an argon flow through the torch of 14 cu ft per hour or more. Slower flow rates led to some embrittlement. The pool of molten metal is much smaller when direct current is used, and it is considered that welds made with the smaller pool show increased ductility because the argon stream then affords more adequate protection. This theory was confirmed by the embrittlement apparent in welds on heavier material made with direct current.

Some Sample Welds

A piece of 0.110-in. sheet had an annealed hardness of 160 (Vickers or Brinell number). It was welded with a zirconium filler rod of similar hardness. The weld hardness was 230—either Vickers or Brinell hardness.

For another example, a fillet weld was made between two pieces of 0.030-in. sheet held at right angles. Even though the backs of the sheets were protected by an argon stream, the weld was so brittle that it withstood no distortion without fracture.

In both these cases, the extent of the molten zone was comparable to the zones arising from the use of a-c.

Table I. Tensile Tests on Zirconium Sheet Welded by A-C

Sample number	Description	Ult. tensile strength, psi	Elongation, %	Reduction in area, %
*BP40	Welded, unannealed	64,600	14	25
*BP41	Welded, annealed	66,600	Not measured**	
†BP42	Welded, annealed and rolled to 0.015 in., unannealed	89,400	3.5	5.5
†BP43	Unwelded, unannealed	83,000	7	19
BP44	Unwelded, annealed	50,600	10	34

*The tensile strengths of BP40 and BP41 are similar because of the occurrence of some annealing during welding.

**Figures for elongation and reduction of area of BP41 are not available as some elongation occurred outside the gage length.

†The figures for BP42 of welded material in the hard-worked condition compare favorably with those for BP43 in a similar state of work.

Table II. Tensile Tests on Zirconium Sheet Welded by D-C

Sample number	Description	Ult. tensile strength, psi	Elongation, %	Reduction in area, %
BP80	Welded in air, unannealed	91,200	4	8
BP81	Welded in air, annealed	86,200	10	21
BP82	Welded in box, unannealed	85,200	4	19
BP83	Welded in box, annealed	87,200	8	18
*BP84	Welded in air, annealed, rolled to 0.015 in., unannealed	121,400	4	6
BP85	Welded in air, annealed, rolled to 0.015 in., annealed	91,400	15	26
*BP86	Welded in box, annealed, rolled to 0.015 in., unannealed	120,400	3	11
BP87	Welded in box, annealed, rolled to 0.015 in., annealed	86,600	12	14
*BP88	Unwelded, unannealed	105,000	4	12
BP89	Unwelded, annealed	76,000	4	18

*Test figures for welds in the hard-worked condition (BP84 and BP86) compare favorably with those for the parent sheet (BP88) in similar condition.

To determine whether or not ductile welds could be made in heavier sections of zirconium, it was decided to try welding in a totally enclosed box. The box (Fig. 1) measured 9 by 7 by 7 in. and was made of mild steel with a transparent "perspex" cover. The electrode holder was fitted into the front of the box through a gas-tight seal of convoluted rubber. The filler rod passed through a small hole covered with sheet rubber held in position by a flange. Welds up to 4 in. long could be made inside this sealed box.

To eliminate all possibility of atmospheric contamination, the box was exhausted to a pressure of 1 mm of mercury, filled with argon and exhausted again to 1-mm pressure. During welding, a flow of argon was maintained to keep the electrode and shield cool. The argon flow also provided a positive pressure that prevented any possible infiltration of air. The argon was not purified, but was of normal welding quality.

This box resulted in the production of ductile welds (welds that were capable of immediate reduction by cold rolling), using either a-c or d-c, with and without filler rods. The molten zone appeared silvery white immediately after welding but tarnished slightly on exposure to the atmosphere. The normal colored bands were present on the heat-affected zone of the sheet, but this was to be expected because the argon atmosphere contained traces of oxygen and nitrogen. It is rather surprising, in fact, that ductile welds can be made at all in argon of the purity used. The probable explanation is that the zirconium remains molten for so short a time that extensive pick-up of impurities is avoided.

This theory was confirmed in a weld made on two pieces of 0.320-in. material. The edges were chamfered to 45 deg, and the weld was made in three runs, using a 3/16-in. filler rod. The hardness increased somewhat—from 181 Vickers on the original slab and 190 Vickers on the filler rod to 264 Vickers on the weld. (Brinell numbers are almost the same). The work had remained hot very much longer than would have been the case with sheet. For such heavy sections as this, purified argon would be necessary to obtain welds as soft and ductile as the parent metal.

Physical, Chemical Properties

Physical properties of the welds are given in Table I (alternating current) and Table II (direct current). All the tests were made on 0.030-in. sheets reduced to 0.015 in. either by grinding or rolling to remove inequalities in the thickness of the weld. All a-c welds were made in the box.

Bearing in mind the difference in the mechanical properties of the original sheet, these figures indicate that the type of current (a-c or d-c) has no significant effect on the mechanical properties of welds made on thin zirconium sheet, whether the welds are made in the box or with the unmodified electrode holder. This applies only to thin sheet; it has already been established that thicker sections are embrittled when welded with the unmodified holder. The figures for the annealed and unannealed welds are similar because of the annealing that occurs during welding.

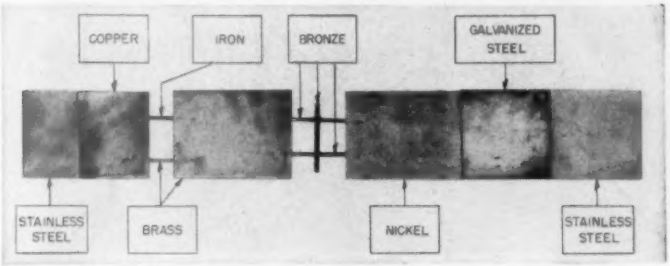
The main interest in the chemical properties of welded zirconium naturally bears on its resistance to corrosion. Corrosion-resistance tests were made by immersing the specimens for 24 hours in a bath at room temperature of concentrated hydrochloric acid containing 1 gram per liter of iron. The iron addition increases the corrosive power of the solution. To increase the corrosion conditions still further, the specimens were rotated in the bath at 300 rpm. All trace of oxide film was removed from the

(Continued on page 63)

NEW G-E SYNCHRONOUS WELDING CONTROL

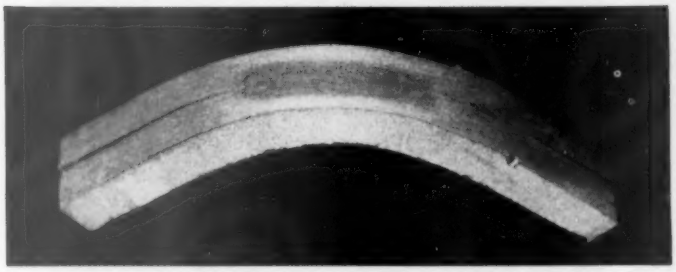
FOR DIFFICULT WELDS

such as these hard-to-weld metals joined by resistance welding



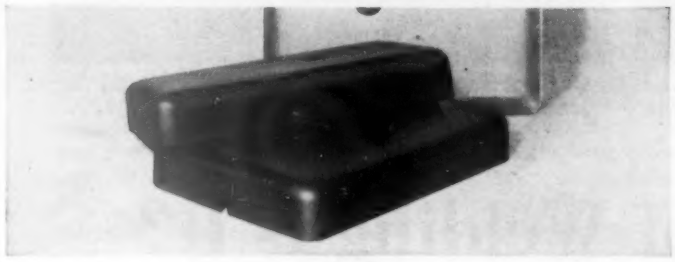
OF HIGH QUALITY

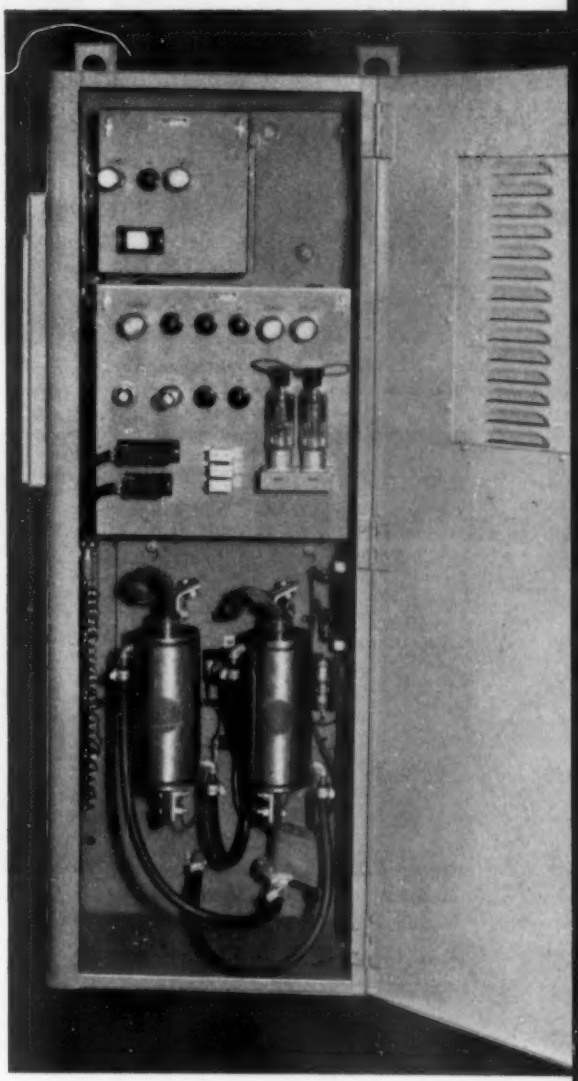
like these welded pieces of aluminum, bent 45° without cracking



AND GOOD APPEARANCE

such as the smooth, welded corners on the relay enclosures





This new G-E synchronous-precision welding control has only *one moving part*, a relay which operates the solenoid valve. There are *no relays* at all in the sequencing control. This means fewer parts to wear out, lower maintenance, and more consistent welding.

By controlling every variable involved in resistance welding except resistance, this new panel gives closer control over weld quality. By providing close current and timing control, it effects real savings in material and time, fewer rejects.

This control is available in both 600 and 1200 ampere frames, for all types of welding machines. Simple plug connections will change the control from one kind of welding to another.

The new synchronous-precision controls are part of General Electric's complete line of resistance welding controls. For further information, contact your nearest G-E Apparatus Sales Office or your welding machine manufacturer.

RESISTANCE WELDING CONTROL

GENERAL ELECTRIC

Section A785-2, General Electric Company,
Schenectady 5, New York
Please send the following:

☐ GEA-5816 "The Story of Resistance Welding," a new bulletin describing the fundamentals of resistance welding and the basic types of control.

☐ GEA-5945 "Synchronous-Precision Control for Resistance Welding," a new bulletin describing the complete line of G-E synchronous controls.

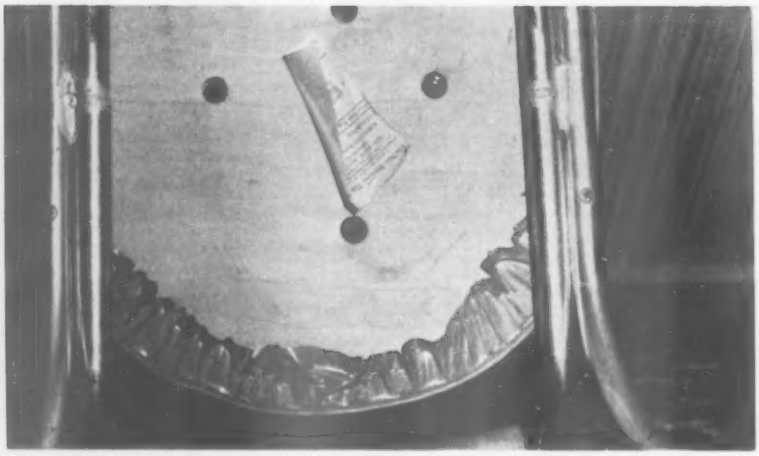
NAME ..... **TITLE** .....

COMPANY .....

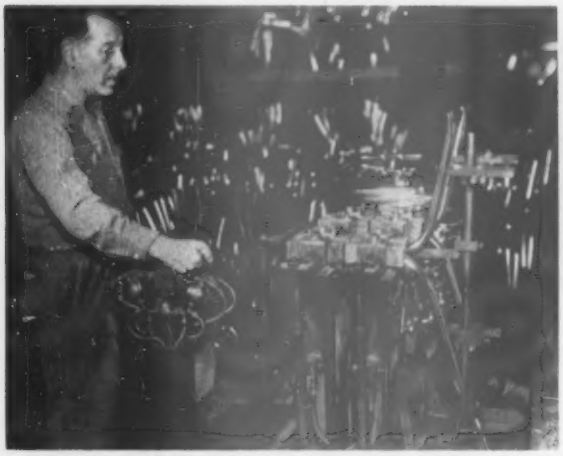
ADDRESS .....

CITY ..... **STATE** .....

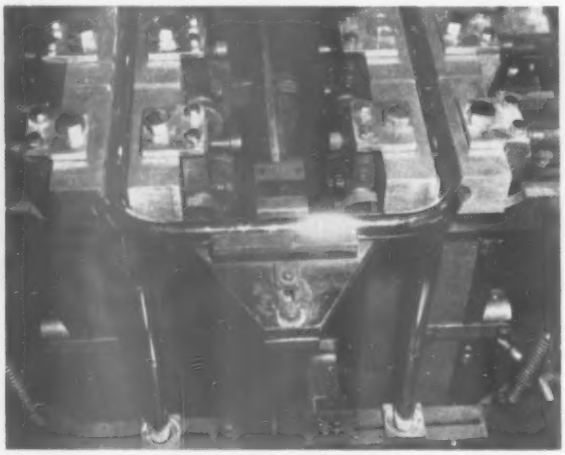
1—KITCHEN chairs were never like this when Grandma was a girl



2—WHEN the three-piece frame of the chair was metal-arc welded, the chromium plating would be blackened. Even aluminum paint doesn't hide it



3—HERE is the new combination welding and forming machine. Lever under operator's hand starts cycle



4—DIES are tight together for welds. Welding is going on at left and in foreground just off center

What Kind of Welding Is It?

It's resistance welding, sure, but what kind? Not spot, not seam, not projection (though it uses dies), not flash and not butt. Maybe we need a new name for it.

KITCHEN chairs made of wood have become obsolete. Modern homes and apartments favor chromeplated steel tubing, like the chair in photo 1. The transition from wood to steel has created many production problems, of which the most complicated is the welding problem.

Any material that contains chromium is liable to form chromium oxide at welding temperature. This oxide makes an unsightly film on the heated surface. Hence when you fusion weld a chromeplated metal, the surface next to the weld will be blackened as in photo 2. There will also be a loss of corrosion resistance because of the chromium lost to oxidation.

For these reasons, Aetna Metalcraft, Brooklyn, N.Y., wasn't too happy about its metal-arc method of welding the chairs. The operation also took three men: a helper to set up the three pieces of the chair frame in a jig, a weldor and a third man to remove the spatter and apply aluminum paint to hide the unsightly blotches.

Aetna's problem was brought to the attention of the Ames Spot Welder Co., also of Brooklyn. Ames engineers thought they could design a machine that would do it by resistance welding, with one man and without the need for aluminum paint after welding.

Here are the facts that had to be taken into consideration:

The tubing used for the furniture is of 1010 steel, with outside diameter of 1 in. and a wall thickness of 1/16 in. The three pieces of the frame include two side legs and a seat-and-back frame.

Before welding, two holes are punched and the bends are made; this requires two operations. The back requires three holes and an end radius cut-off; this is done in one operation. The seat fastening holes are punched next, another operation.

Plating requires 32 individual immersions, which start with a cleaning and rinsing. In successive dippings, the parts are given a bright copper finish, a nickel "kiss" and finally their chromium. Because of tight restrictions on the use of nickel, only 25% of the amount formerly used can be applied in conjunction with the chrome. Nickel bonds very well to chromium. Its short supply added further to the welding difficulties.

How Machine Does It

To do the job automatically, Ames engineers perfected a 40-kva combination forming machine and resistance welder. This machine requires only one operator. It is air-operated and electronically controlled from a single lever (photo 3).

The operator merely places the three pieces into position and pulls back the lever. This brings the dies into place and holds the tubing under pressure. The contact surface is then prepared for welding.

When the operator presses the lever into a forward position, the welding contact area is closed for the welding cycle. The tubing is again put under pressure, and the welding cycle is introduced at two points: the front and back legs on the right. The welding then crosses over to the left, and the same cycle is repeated (photo 4). After the final two welds, the operator pulls the lever back into neutral. The dies now recede, and the chair frame is removed, ready to receive the cushions.

The welding cycle is so closely controlled by automatic timing that the chromium adjacent to the joined surfaces is only slightly discolored or darkened. No aluminum paint has to be used, and the chromium is readily alloyed into the tubing without the loss of its corrosion resistance.

Today, Aetna can weld 150 chairs in a man-hour. Formerly, the output was 20 chairs per man-hour.

WELDS IN ZIRCONIUM

(Continued from page 60)

specimens with emery paper before immersion.

Figure 4 shows the condition of the specimens after treatment in the corrosive bath. It is clearly seen that the actual welds and the adjacent heat-affected metal are more highly resistant to corrosion than the parent sheet; this improvement in the corrosion resistance of the welds has been displayed by all specimens tested to date. Examination under the microscope shows that the corrosive pits are larger and deeper on the non-heat-affected metal than on the welds.

Welding under Seal

The reason for the superior corrosion-resistant properties of the weld and heat-affected area is not easy to find. It could, possibly, be due to the burning out of carbon during welding.

It is possible to produce ductile welds on thin sheets of zirconium, but purer argon than is at present commercially available is necessary to weld zirconium slab or plate without increasing the hardness above that of the original metal. Between the extremes of thin sheets and the slab or plate lies a range of thicknesses that is both important and useful. Ductile welds can be made in these thicknesses using commercial argon, but the conditions demand complete shielding of the arc.

Figure 2 shows a welding "hood" developed to weld seams in flat sheet or large tanks. The hood has a rubber seal around the bottom that is pressed against the sheets being welded. The electrode holder is fitted in the same way as in the box (Fig. 1). The hood can be moved along the work as welding progresses.

Two hoods, placed back to back against each other, would effect considerable economies when vertical seams are welded in thick sheet. Welding would be almost twice as fast, and it would not be necessary to protect the back of the welds with a stream of argon. In order to maintain a positive pressure of argon inside the hood, it is necessary to have a subsidiary argon flow of 5 cu ft per hour into the hood in addition to the normal flow of 16 cu ft per hour through the holder. Positive pressure within the hood is essential to prevent air diffusing into it with consequent embrittlement of the welds.

Figure 3 shows a further modification of the box. It is now arranged for welding moderate-size pieces of almost any shape. In principle, construction follows the lines already described, but the box is mounted between two laboratory retort stands, on which it can be raised or lowered to accommodate the parts to be welded. The arc is level with the bottom of the perspex sides. The work is enclosed by a curtain of polythene film, which is secured with cellophane tape to make an airtight enclosure. For particularly awkward applications, it would be possible to construct a hood of this type that incorporates rubber gloves through which the electrode holder and filler rod can be manipulated. A further development of this principle would be a cabinet along the lines of a sandblasting cabinet.

Summary

The conditions necessary for the production of ductile welds in zirconium are:

1. On sheets of 0.030 in. or thinner, welds made with direct current are definitely superior to those made with alternating current. When direct current is used for welding with the standard-type holder, the only additional protection needed is an argon stream on the back of the weld.

2. To weld zirconium sheet in thicknesses over 0.030 in. and up to ¼ in., it is necessary to shield the work in a much more exacting manner. All air must be excluded from the weld zone. It is not, however, necessary to purify the argon.

3. To insure ductile welds in sheets thicker than ¼ in, the welds must be made in an atmosphere of purified argon. There can be no trace of atmospheric gases in the argon.

4. The corrosion resistance properties of properly made welds are so good that the welds can be expected to outlast the parent sheet under conditions of corrosive attack.

* * *

As the welding properties of titanium are in many respects similar to those of zirconium, it can be said that the recommendations made here for the welding of zirconium should apply almost equally to the welding of titanium.

1—METAL-ARC inert-gas process joins skirt assembly to dished head. This is a structural weld and one not subject to pressure

2—TUNGSTEN ARC was used for pressure welds. This fillet joins shell to baffle

X-Ray Welds for Aluminum Tanks

BY JEROME HERTEL

Leader Iron Works, Inc.
Decatur, Ill.

WE at Leader Iron Works have been making vessels and tanks for the chemical industry for years. Most of these tanks have been fabricated of steel: mild steel, corrosion-resistant alloy, or, in some instances, "superalloy." A recent job, however, confronted us with the problem of producing heavy-walled vessels made of 2-S aluminum. These pressure vessels were to be fabricated to ASME specifications and the welds were to be 100% inspected by X-rays.

The only practical way to accomplish this task was by the inert-gas process. At first, the consumable-electrode inert-gas process looked like the logical answer, but we had to rule it out, except for structural welds, because of X-ray requirements. All welds subject to pressure were made manually using a tungsten-arc torch.

The vessels made under this contract ranged from 4 to 8 ft in diameter and from ¼ to 1½ in. in shell thickness. The weld joint design included: (1) straight butt welds without vees for thin material, (2) straight fillet welds, (3) lap welds and (4) double-vee butt welds with a 1/8 in. land on the heaviest material.

First step in fabrication was to weld the skirt assembly to a dished head, photo. 1. This, being a structural weld, could be made by means of the consumable-electrode inert-gas process. The welding was done on a welding positioner to facilitate down-hand welding. The thickness of the material for both the skirt assembly and dished head was 3/8 in. An aluminum wire of 1/16 in. diameter was fed through the welding gun, using 375 amp d-c reverse polarity, with an argon flow of 40 cu ft per hour. This was purely a fillet weld, made after the parts had been tack welded together. The only preparation and the only postweld clean-up operation was a light wire brushing.

All pressure welds were made by manual inert-arc, using a tungsten electrode. In photo 2, the operator is making a fillet weld between the 1-in. shell and the 3/8-in. baffle. He used a welding current of 400 amp,

(Continued on page 69)

3—SMALLER tank at right contains 40 ft of welding. Larger processing vessel at left is 6 ft in diameter and has 50 ft of X-ray quality welds

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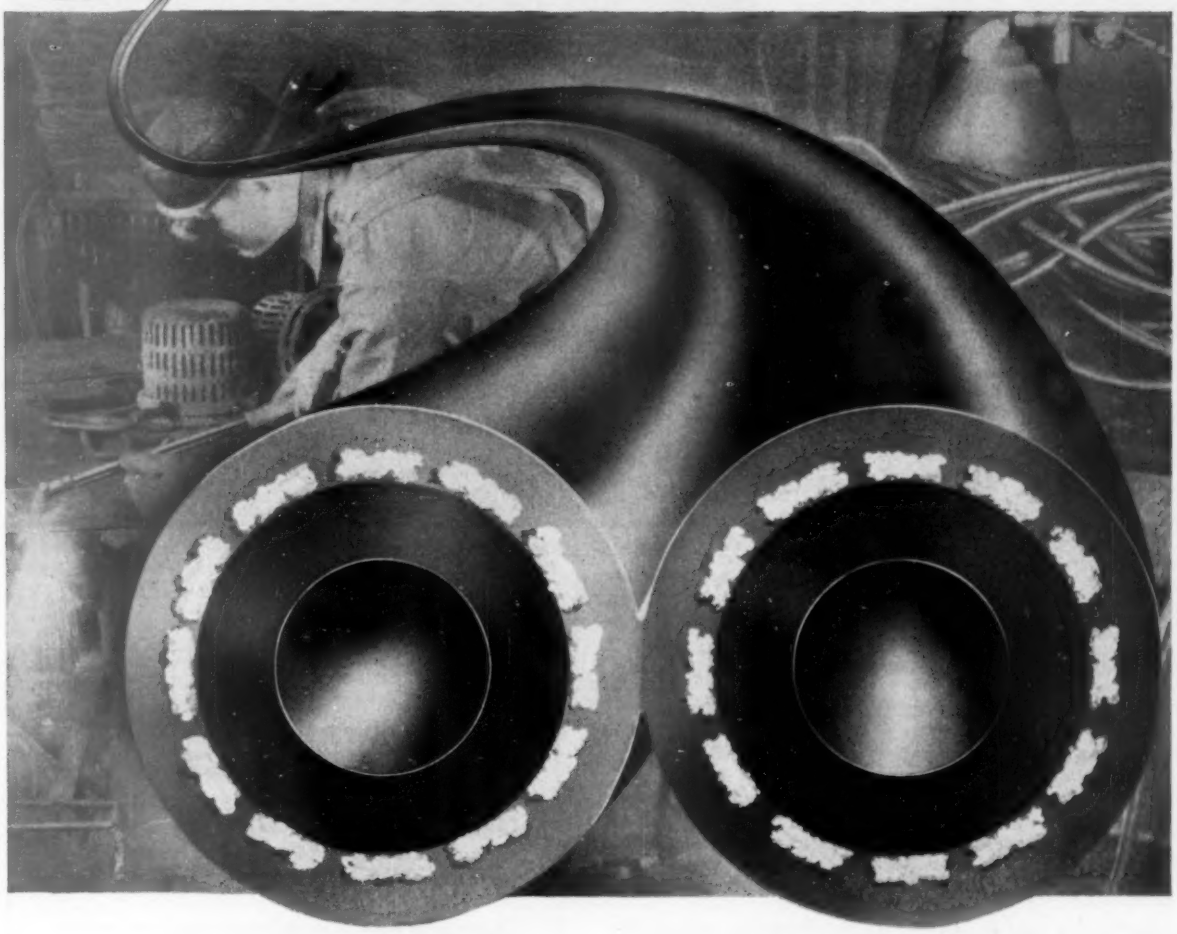

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Minimum Physical Properties for RWMA Alloys

Group A. Copper-Base Alloys

R.W.M.A. Class	Form and Size	Proportional Limit p.s.i.	Hardness Rockwell B	Conductivity % I.A.C.S.	Ultimate Tensile Strength p.s.i.	Elongation % in 2"
1	Rods up to 1" dia.	20,000	65	80%	60,000	20%
	Rods over 1" to 2" dia.	17,500	60	80%	55,000	25%
	Rods over 2" to 3" dia.	15,000	55	80%	50,000	25%
	Rect. up to 1" thick	20,000	55	80%	60,000	20%
	Rect. over 1" thick	15,000	50	80%	50,000	25%
	Forging up to 1" thick	20,000	55	80%	60,000	20%
	Forging over 1" to 2" thick	15,000	50	80%	50,000	25%
	Forging over 2" thick	15,000	50	80%	50,000	25%
2	Rods up to 1" dia.	35,000	75	75%	65,000	15%
	Rods over 1" to 2" dia.	30,000	70	75%	60,000	15%
	Rods over 2" to 3" dia.	25,000	65	75%	55,000	15%
	Rect. up to 1" thick	35,000	70	75%	65,000	15%
	Rect. over 1" thick	25,000	65	75%	55,000	15%
	Forging up to 1" thick	35,000	72	75%	65,000	15%
	Forging over 1" to 2" thick	30,000	70	75%	55,000	15%
	Forging over 2" thick	25,000	65	75%	55,000	15%
	Castings	20,000	55	70%	45,000	12%
3	Rods up to 1" dia.	50,000	90	45%	100,000	10%
	Rods over 1" to 2" dia.	50,000	90	45%	100,000	10%
	Rods over 2" to 3" dia.	50,000	90	45%	100,000	10%
	Rect. up to 1" thick	50,000	90	45%	100,000	10%
	Rect. over 1" thick	50,000	90	45%	100,000	10%
	Forging up to 1" thick	50,000	90	45%	100,000	10%
	Forging over 1" to 2" thick	50,000	90	45%	100,000	10%
	Forging over 2" thick	50,000	90	45%	100,000	10%
	Castings	45,000	90	45%	85,000	10%
4	Rods, all sizes	85,000	33-C	20%	140,000	2%
	Rectangles, all sizes	85,000	33-C	20%	140,000	2%
	Castings	60,000	33-C	18%	90,000	1%
5	Castings	12-16,000	65-85	10-15%	65-75,000	10-2%

I.A.C.S. — International Annealed Copper Standard. This is the resistance of a wire one meter in length and weighing one gram, at a temperature of 20 C; the resistance of the specified wire is 0.15328 ohms.

Group B. Copper-Tungsten Alloys

R.W.M.A. Class	Form and Size	Hardness Rockwell B	Conductivity % I.A.C.S.	Ultimate Compressive Strength p.s.i.
10	Rods, Bars and Inserts	72	35%	135,000
11	Rods, Bars and Inserts	94	28%	160,000
12	Rods, Bars and Inserts	98	27%	170,000
13	Rods, Bars and Inserts	71-76A	30%	200,000

Courtesy Ampco Metal, Inc.

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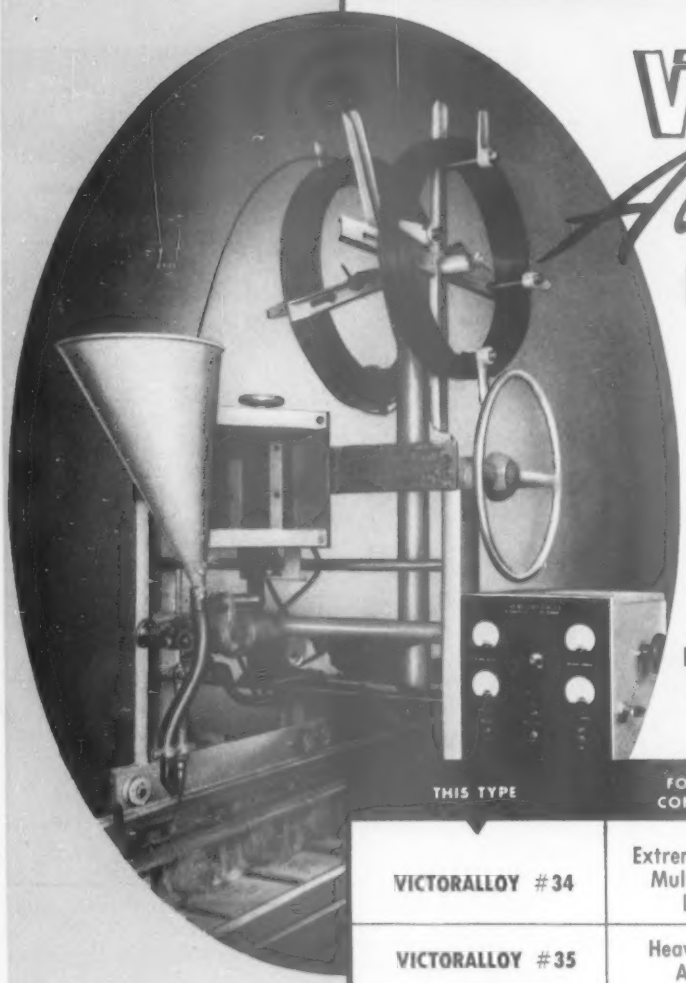

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FOR REAL HELP TO SMALL BUSINESS

It is ironic that one of the first jobs of the Eisenhower administration, so widely, and erroneously, tagged as a "big business" administration, must be to go to the relief of small business. This is necessary because the preceding administration, while continually proclaiming its tender regard for small business, actually impaired gravely the ability of small business to carry on successfully. This it did in the necessary haste of devising an emergency tax program to finance rearmament and the Korean War. Now the new administration must revise this tax structure to give small business a chance to make its key contribution to an expanding American economy.

How Taxes Hurt Small Business

Since the outbreak of the Korean War, small business has been handicapped by two principal features of the emergency tax program:

1) Many small firms are unable to retain enough of their earnings to provide for expansion because these earnings are drastically limited by the excess profits tax.

2) Small companies have received a very small share of the tax concessions allowed by the federal government to encourage construction of defense facilities.

A small business that succeeds and hence grows is particularly hard hit by the excess profits tax. That tax, of course, applies to corporations having a net income of more than $25,000 per year. It results in taking up to 82 cents on every dollar of profit that the company earns above what is called an "excess profits credit." For most small companies the credit depends on what was earned in 1946-49. This creates an element of gamble and discrimination in determining the amount of tax to be paid. Time has proved that it is impossible to select a base period for the tax that is fair to all companies. A young company starting in 1946-49 is peculiarly vulnerable, as its earnings in that period were necessarily low. Even on modest earnings today, it would pay a high excess profits tax.

It is true that Congress wrote into the excess profits tax law provisions to lessen the impact of the tax on growing companies. However, none of these provisions in practice has given much relief to small business.

"Relief" Provisions Give Little Relief

Small firms rely almost entirely on retained earnings to provide funds for improving their plants and equipment. They get very little help from the provisions (1) that no more than 70 per cent of total profits can be taxed away, (2) that additional earnings are allowed on an increase of invested capital or (3) that growing companies are allowed a

rate of return on capital equal to the industry average.

Most large firms can obtain additional funds in the securities market. But small firms find it difficult to increase their capital by selling securities, since investors generally prefer the stocks or bonds of nationally known and seasoned companies. Few small companies, therefore, can reduce their tax burdens by increasing their invested capital, and few can meet their needs for equity capital if their rates of profit are no higher than those of the leading companies which generally set the average profit.

Small business has been equally at a disadvantage in the matter of accelerated depreciation for tax purposes. The government has encouraged a great expansion of our industrial plant, despite the very high rate of taxation on corporate earnings, by granting certificates of accelerated amortization on new plants built to support the defense program. These certificates allow business to charge off the cost of defense plants at a rapid rate. This decreases the earnings that are subject to taxes, and so increases the part of the earnings that may be retained in the business.

Growth is Stifled

But most of these tax concessions have been made to large firms especially equipped to handle the complex problems of defense production. Of the $12 billion of new facilities so far approved for fast amortization, only 11 per cent are for companies with less than 500 employees, although the share of such companies in the normal civilian business is about 30 per cent. In only 2 of 12 industries studied by the Small Defense Plants Administration were small firms receiving what was estimated to be a fair share of the total tax amortization awarded.

Because they are unable either to retain enough earnings after taxes or to step up their depreciation allowances, most small firms are unable to keep up in the race to expand and modernize plant capacity. The Small Defense Plants Administrator, in his report to Congress, emphasized that small companies have been unable to do their full part in the defense program for lack of capital.

The Council of State Chambers of Commerce recently published an eight-state survey showing widespread cutbacks of plans for new plants by small and medium-sized companies. According to this report, "high federal taxes enacted since the beginning of the Korean War appear to be placing an effective brake on the rate of industrial expansion in all the states surveyed and probably in the 48 states generally . . . It is principally the small and medium-sized companies whose growth is being stifled."

Some Ways to Help

The first step to relieve small companies should be to free them from the excess profits tax. The nation as a whole would be far better off if the excess profits tax were allowed to die as scheduled on June 30, since the tax promotes waste as it stifles incentives. It is quite possible, however, that the politics of tax reduction, as opposed to the economics, will prevent the elimination of the tax during 1953.

If the tax is extended, provision should be made for a much broader exemption to smaller corporations. If net income up to $100,000 a year, which in these days still constitutes small business, were exempted from the tax, the loss of revenue to the government would be about $175 million. This relatively small amount could easily be offset by an increase in employment and incomes if small business is freed from its financial strait jacket and allowed to expand. Careful attention should be given also to the possibilities of allowing a higher rate of return on the first $1 million of capital (roughly the amount it takes to provide 100 jobs) and of making special accelerated depreciation allowances to smaller firms. This is a matter so important that we shall return to it in a future editorial.

Relief for small business—relief from a financial paralysis that has kept it from playing its dynamic part as a growth element in our economy—would do much to give the lie to the notion that the Eisenhower administration is a "big business" operation. Much more important, it would be a long stride toward releasing the dynamic energies of many small businesses and businessmen to forward a continuing and expanding prosperity.

McGraw-Hill Publishing Company, Inc.

X-RAY WELDS IN ALUMINUM

(Continued from page 64)

a-c, high frequency, a 1/4-in. tungsten electrode and an argon flow of 50 to 60 cu ft per hour. Filler metal of 2-S aluminum was added in the joint.

As in all aluminum welding operations, the joint was prepared for welding by wire brushing with a stainless-steel brush. Then tack welds were made, followed by continuous inert-arc welding on the side opposite the tacks. Upon completion of this weld, the tacks were chipped out to clean solid metal and inert-arc welded. Again, the welding was done in the downhand position. The welder controlled his welding location through a remote control unit, which operated the turning rolls upon which the vessel rested. After the seam had been completed, it was finished by a light wire brushing.

Of exceeding importance in welding heavy aluminum sections to X-ray standards is cleanliness. We have a space in our plant isolated from other operations and maintained as dirt-free as possible. All operators are expected to observe personal cleanliness. During forming operations, the aluminum plate was protected by a plastic film, this film being stripped back during welding operations. All joint cleaning was performed immediately prior to welding. All filler metal was cleaned of oxide film immediately before use to eliminate the slightest chance for inclusions and poor fusion.

The tank at the right of photo 3 is the smaller of the two types of vessels fabricated under this contract. It contains 40 ft of welds. The larger chemical processing tank is 6 ft in diameter and has 50 ft of such welds.

Every joint had to be of X-ray quality. In our search for information on X-ray quality aluminum welding, we found very few instances where aluminum had been inspected by non-destructive means. This made quite extensive experimentation necessary to determine best procedures to use. By extra precautions to guarantee cleanliness, adherance to approved procedures, and maintaining welding equipment at peak efficiency, the desired X-ray quality welds were obtainable. Altogether, the eight weldors producing the vessels made approximately half a mile of X-ray quality welds.

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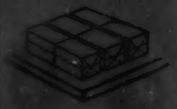

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NEW portable X-ray unit is being set up to radiograph hull of sub

Courtesy Aluminum Co. of America

WELDING of a 6,200-gallon tank trailer of the new XA54S aluminum alloy instead of 3S alloy permitted a 25% reduction in thickness of shell

"X" Marks the Spot

THE U. S. Navy, to insure pressure hull welds strong enough to withstand the tremendous strain of depth charges, demands that all welds on submarines be checked by X-rays before these craft go to sea. (The Navy has never lost a life or a ship as a result of structural failure.)

At three of Uncle Sam's naval shipyards, the intricate job of locating minute imperfections in "confined" areas of a ship's structure has been greatly simplified. A newly developed industrial X-ray unit is said to be able to do a job in 3½ minutes that used to take four hours.

Since the X-ray head of the "midget" machine weighs under 150 lb, it can be brought directly to the welded structure. Its small size and portability also makes possible the taking of "inside out" pictures, in which the X-ray head is placed inside the structure to be radiographed.

As yet there are only three units of this make in existence—all in naval shipyards. In the picture at top, J. J. Inman, radiographer at the San Francisco Naval Shipyard, is setting up the unit within the fairwater (outer hull structure) of a sub. After the unit is in the proper position, Inman will go to the remote control panel and take the picture. A number has been placed on the area covered by the film. When the picture is developed, the radiographer can find the exact location of the imperfection within the structure. It takes 15 seconds to X-ray the fillet welds of this structure, as compared to 1½ hours with radium pills.

W. H. Hammond, laboratory director at the San Francisco shipyard, says the unit is also used to inspect valve castings and high-pressure piping. In the inspection of a welded joint between two sections of pipe, the X-ray technician can bring the X-ray unit inside the ship hull and change its position for each exposure area without disturbing the pipe. He can also insert it inside a large casting or insert the snout of the machine inside a smaller casting.

Operating in the range from 75,000 to 250,000 volts, the machine is capable of X-raying up to 3½ in. of steel.

* * *

Are New Alloys Weldable?

(See top right photo)

NEW aluminum alloys XA54S and XC56S are said to offer considerable advantages for fabrication. An example is the 6,200-gallon aluminum tank trailer pictured at top right. The use of XA54S in place of 3S alloy permitted a 25% reduction in shell thickness.

XA54S alloy, in the form of sheet and plate, is weldable with a few limitations by all of the weld methods used on other aluminum alloys.

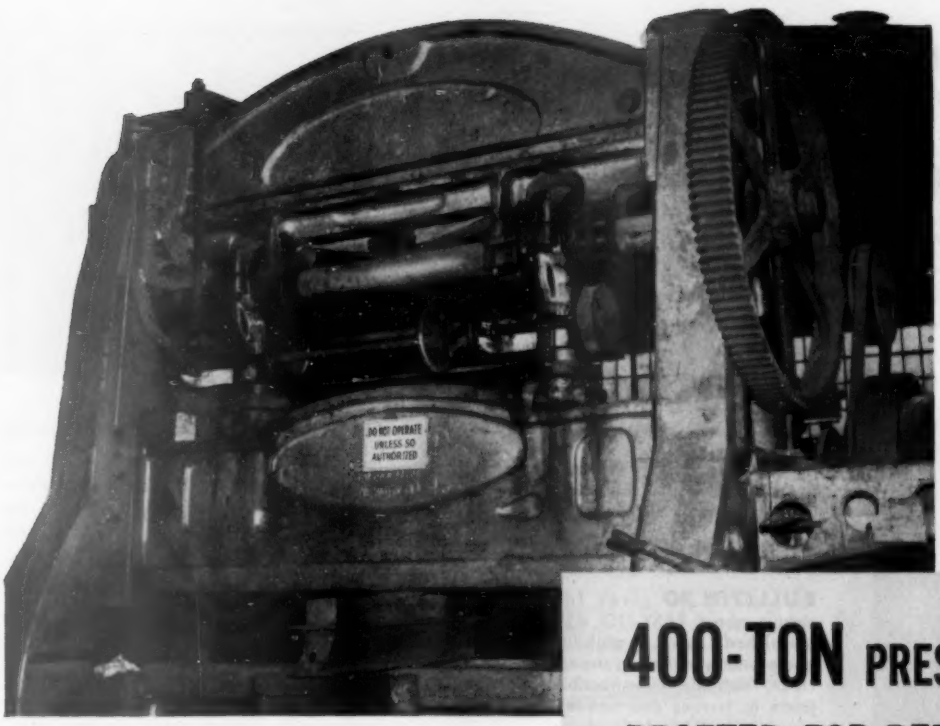
The best welding process from the standpoint of freedom from cracking is the inert-gas metal-arc process, semiautomatic or automatic. Good results have been obtained when welding XA54S up to 1-in. thick. For metal ¼-in. and less in thickness, the inert-gas tungsten-arc process has given good results. No flux-coated electrode for metal-arc welding has been developed for XA54S. Gas welding, however, can be used on thin material and for short welds.

The resistance-welding characteristics of XA54S are very good for both seam and spot welding. Machine settings and techniques are much the same as for other non-heat-treatable aluminum alloys.

ALLOY XC56S

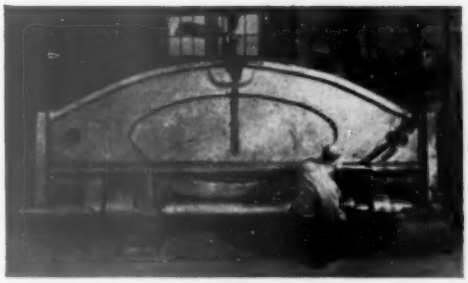
A limited amount of weld testing on XC56S alloy has resulted in the following tentative conclusions:

1. The general weldability of XC-56S alloy is good, and it should be suitable for any of the arc-welding processes. Gas welding of this alloy has not been investigated but will probably be suitable only for sheets of 0.125 in. and thinner.
2. The best filler material for arc welding is XC56S wire.
3. It should be possible to control cracking when welding XC56S. This alloy combination is similar to welding 61S with 43S.
4. The strength of welds in XC56S made with filler wire of the same alloy can be based on the minimum tensile strength of the annealed temper, *i.e.*, 38,000 psi.
5. The ductility of welds in XC56S in any temper is excellent. In this respect, the welded joints are substantially superior to welds in 61S-T6.
6. Alloy XC56S will not be suitable for brazed joints except, possibly, simple joints made by torch brazing. The difficulty is primarily one of getting uniform wetting of the surface with the brazing flux.
7. The resistance-welding characteristics of XC56S should be excellent.



THIS PRESS BRAKE weighs 122,000 pounds and its rated capacity is 400 tons. It is used for straightening armor plate measuring up to 12 feet wide, ¾ inches thick and 16½ feet long.

400-TON PRESS BRAKE DRAFTED FOR DEFENSE



V-GROOVE GRINDING COMPLETED, the two segments of the 5-foot x 12½-foot crown are ready for braze welding with ANACONDA-997 (Low Fuming) Bronze Welding Rod. Body of the crown is 7½ inches thick. The bottom flange measures 19 inches wide x 3½ inches thick and the top flange is 12½ inches wide x 3½ inches thick.

HERE'S THE FINISHED JOB—which required 250 pounds of welding rod.

Ready to be scrapped because of a 2½-foot diagonal fracture, the crown section of this press brake was saved by braze welding with ANACONDA Rod. A new crown would have cost thousands of dollars and taken several weeks' time for delivery. Remembering our slogan, "Don't Scrap It—Braze Weld It," the owners consulted Hebeler Welding Company, Buffalo, N. Y., who braze-welded the crown with ANACONDA-997 (Low Fuming) Bronze Welding Rod. In less than a week the press was ready for service—straightening armor plate.

There's a suitable ANACONDA Bronze Welding Rod for just about every type of welding job. Anaconda Publication B-13 contains suggested applications and procedures for production and repair welding with bronze rods. Write for it today—Address The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

52176

braze or weld with confidence

ANACONDA® ***welding rods***

ANACONDA

Best by test—"brazing with EASY-FLO 45"

● That's what the Diamond Sales Co. of Kansas City, Mo. says about the assembly of their bus and street car fare box shown below. Here's the complete quotes—*"We tried every known method of welding and soldering and find that brazing with EASY-FLO 45 is the best. It is as strong as the parts themselves and warping is held to a minimum. It is cheaper for us and saves us money on the clean up job and takes a good plate."*

Thousands of other manufacturers say the same thing about EASY-FLO 45 low-temperature silver alloy brazing. This bulletin tells you why.

BULLETIN 20 gives full details about EASY-FLO 45's unmatched speed, reliability and economy in making strong, clean, virtually indestructible joints in ferrous and non-ferrous metals. Write today for a free copy.

LEFT — Arrows point to the four EASY-FLO 45 brazed joints in the fare box proper which is made of heavy brass or steel tubing. The brazed assembly is chrome plated.

RIGHT — The money vault is made of brass tubing to which the cast bottom and top are brazed with EASY-FLO 45. Chain link pin (top arrow) is also brazed.

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Extension for Valve Wheel

By Elton Sterrett

WHEN large-diameter valves are closed against the high pressures common to oil trunk lines, they are frequently hard to open. To make it easier, the weldor at one pipeline station fashioned an extension. First he took a circular plate, which could be bolted to the spokes of the valve wheel, and welded a pipe nipple in the center. Two notches in the nipple engage a pin projecting from the stem of a T-head made of pipe. Sliding freely within the lower nipple, the T-head provides a socket at the top for a handle of either pipe or hardwood. By using a long handle, sufficient torque can be obtained to break loose a tight valve.

The device can also be made to function as an indicator. This is accomplished by setting the pin at the base of the stem at the proper height. When the valve is fully open and the rising stem has reached the top of its travel, the pin should be lifted just free of the slots.

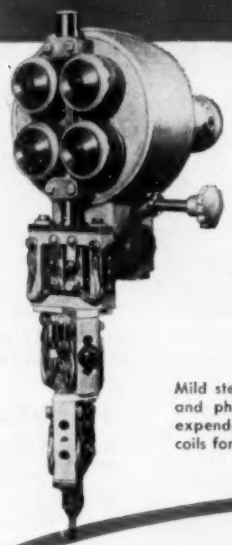
* * *

Inert-Arc Welding on Jet

Courtesy General Electric Co.

WELDOR at McGregor Mfg. Corp., Birmingham, Mich., is welding an Inconel part on a power-recovery turbine for an aircraft engine

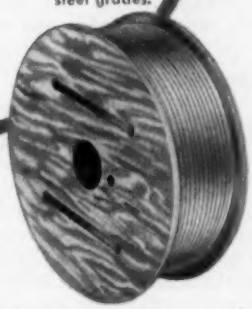
Every Welding Need



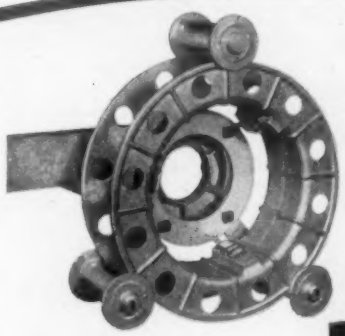
The Reid-Avery type 4R automatic head and control originally designed for Raco composite type A, may be used with equal success for lightly coated open arc or for submerged arc welding.

Raco composite type A heavy coated automatic (open arc) electrodes, a "Reid-Avery" first, can be furnished for all mild steel, low alloy high tensile, low hydrogen, hard surfacing and stainless steel grades.

Mild steel, alloy steel, stainless steel, aluminum and phosphor bronze wire are available on expendable wooden spools or in layer wound coils for gas shielded arc welding.



The Raco "free wheeling" reels are especially designed for high speed automatic machines. The ball bearing trunnions enclose the coil so there is no over-run or loose strands and larger coils can be used. Changing coils is a matter of only a few seconds and no tools are required. Available in 12, 14, 25 and 36 inch sizes, for any weight from 50 to 200 lbs.



The Raco coils of wire for submerged arc welding have long been known for their uniform high quality and convenient, easy to handle package. Special attention is paid to the accurate weight, lay and temper of the wire so that the wire will accurately follow a seam. Available in mild steel, alloy steel and stainless steel.

Since 1919 Reid-Avery Company has specialized in the manufacture of all types of welding electrodes and wire. The large modern plant in Baltimore is equipped for wire drawing, annealing, pickling, coating, cutting, winding and packaging. Every phase of welding electrode and wire production is completely controlled from start to finish. You can be assured of uniform high quality and the best possible deliveries.

We also manufacture a complete line of manual electrodes in the following grades:
Raco Mild Steel, Raco Low Alloy High Tensile, Racocast for nonmachinable welds on cast iron, Raco Feral for welding aluminized sheets, Raco Low Hydrogen, Raco Hard Surfacing, Racolloy Stainless, Racolloy Nickel and Nickel 60 for machinable welds on cast iron.

The REID-AVERY COMPANY
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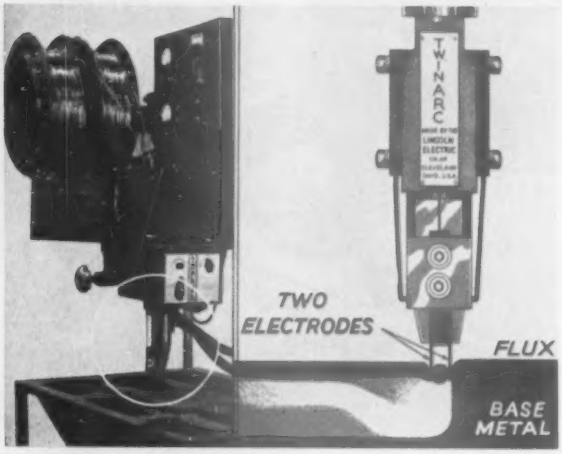
SINCE 1919 PRODUCERS OF ARC WELDING ELECTRODES AND WELDING RODS

New Products . . .



FASTER welding speeds with less distortion are obtained with new double-electrode submerged-arc process

AUTOMATIC REBUILDING of track-rails on crawler tractors is simple with new Rexarc RM6 welding machine

Twin-Arc Welding

251 SPEED increases up to 50% are claimed for a new submerged-arc process employing two small electrode wires instead of a single larger one. Called "Twinarc" welding, the process includes a special single head and jaw for feeding the two electrodes into the weld crater. The higher currents possible with two electrodes increase the rate of metal deposition, amount of penetration and thus, welding speed.

"Twinarc" welding is recommended for butt or fillet welds in ¼-in. or thicker plates where submerged-arc welding has normally been used. Typical of the speeds possible is that used in making a ¾-in. fillet weld, 15 ipm at 1,500 amp.

A special electrode jaw, wire feed rolls and wire guides adapt any standard Lincolnweld head for the new process. The standard single head controls are used as well as the standard d-c welding current generators.

The two electrodes are normally in line along the seam but may be skewed ⅛ in. so that they are across it to make a wider bead. If a still wider bead is desired or if burn-through is a problem, the electrodes can be spaced side by side. .

THE LINCOLN ELECTRIC CO., 22001 St. Clair, Cleveland 17.

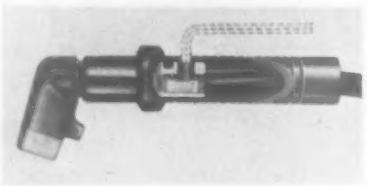
* * *

D-C Electrode

252 A NEW general-purpose mild-steel welding electrode for d-c reverse-polarity operation is designated as G-E type W-610A. It meets AWS Class E-6010 specifications. It is said to facilitate butt, fillet, lap joint and edge welding in all positions. Characteristics include ability to take high currents, together with freedom from fingernailing, spatter, reaction pitting and blistering. Applications so far include steam lines, ships and pressure vessels.

GENERAL ELECTRIC CO., Schenectady 5, N. Y.

* * *



New Cable Connection

253 A LARGE, fine-threaded socket screw of ½-in. diameter holds the welding cable to the Bernard "Shortstub" electrode holder. This combination connecting means allows either a soldered connection, a friction connection or a combination of both. A hole is provided in the fiber electrode holder handle for inserting a hex key wrench to tighten the socket screw. Making this tight takes only a few seconds.

BERNARD WELDING EQUIPMENT CO., 10222 Avenue N, Chicago 17.

INFO-AID CARDS

on pages 33-34 filled out with item numbers of products catching your eye, will bring you additional information about them.

Track-Rail Welder

254 THE new Rexarc Model RM6 automatic welding machine includes a sturdy bed, a motor-powered carriage and an automatic welding head for rapid rebuilding of crawler tractor track-rails. It can also be used to hardface or rebuild scraper blades, dozer lips and similar abrasion-damaged parts.

The carriage is all-welded and carries the welding control. welding head, flux bin and feed chute, electrode reels and carriage-drive motor. The main control panel indicates current and voltage, travel speed, rod feed adjustment and other useful information. The welding head can be shifted to a rotating fixture for rebuilding idlers, rolls, wheels and other circular or cylindrical shapes.

Other models of Rexarc automatic welding machines are suited for rapid production of tanks, cylinders, large plates and long beams.

THE SIGHT FEED GENERATOR CO., West Alexandria, O.

* * *

Horizontal Electrode

255 SPECIALLY designed for the horizontal position, the Weldbest "Deepweld" is a new electrode having high penetration on both butt and fillet welds. It can be used on steels having 54,000 to 80,000 psi tensile strength. Economical welding of plates up to ¾-in. thick is possible because square butt joints suffice. The deep penetration characteristics of the electrode are remarkable.

WELDWIRE CO., INC., Emerald & Hagert Sts., Philadelphia 25.

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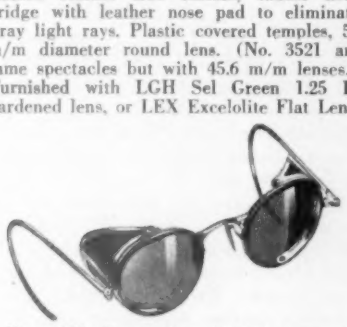
QUALITY
EYE AND FACE
Safeguards

Welders' Helper Spectacles Prevent Eye Accidents

Here are two styles of Goggle-Spectacles which have proven their popularity as year after year standard equipment in many of America's foremost industrial plants. They are extremely lightweight, fit perfectly, and offer full eye protection against glare and flying particles.

No. 3520 Spectacles. Nickel frame, perforated leather side shields, saddle nose bridge with leather nose pad to eliminate stray light rays. Plastic covered temples, 50 m/m diameter round lens. (No. 3521 are same spectacles but with 45.6 m/m lenses.) Furnished with LGH Sel Green 1.25 D. hardened lens, or LEX Excelolite Flat Lens.



No. 4003 Spectacles. Nickel frame, 47 m/m drop oval (45 x 48 m/m) lens. Green acetate side shields. Furnished with either of three hardened 45 x 48 m/m lenses: (1) LCH, Clear 1.25 D. (2) LCG, Clear 6.00 D, and (3) LGH, Sel Green, 1.25 D.

NOTE: Sel Green Hardened Lenses are supplied in three shades: "A" (light 1.5), "B" (medium 1.7), and "C", (dark 3). These lenses are made from optical blanks, ground, polished, edged, etched and graded to density. Meet all Federal Specifications.

You will be 100% satisfied with the unusual service rendered by these recommended Welders' Helper Spectacles. Ask your dealer for these Sellstrom spectacles, or write us direct.

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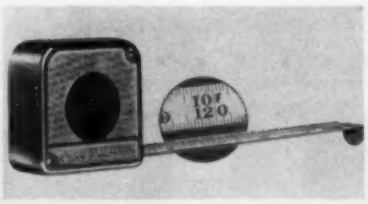
626 N. Aberdeen Street, Chicago 22, Ill.

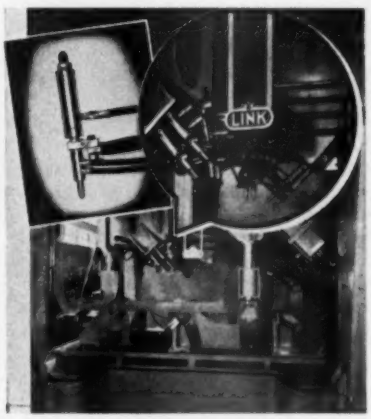


Steel Weldor's Rule

256 EXTRA rigidity is claimed for a new 10-ft., spring-recoil type weldor's rule. It is said to resist collapsing when extended either up or sideways. The tape is extra wide and finished in white with large, easy-to-read markings in black. An automatic brake holds the extended tape at any point without use of mechanical locks. The tip hook of the "Chief" rule swings to the side for obtaining accurate inside measurements. If the tape is damaged, it can be easily and cheaply replaced.

ATLAS WELDING ACCESSORIES CO., 707 E. Lewiston St., Ferndale 20, Mich.

* * *



R-W Standard Holder

257 THE new Link electrode holder is said to be applicable to standard types of transformer cables. It utilizes a collet-type design, applicable in gun mounting. It is said to be more stable than conventional holders when using offset electrodes.

Economy of the Link holder is based on a two-piece construction, permitting replacement of either contact plate, or shank, or the repair of either. Shanks are available in lengths to permit the use of one welding electrode length, regardless of relationship between cylinder and part. Another advantage of the Link holder is on-the-job replacement or repair without pre-selection of holders.

LINK WELDER CORP., 13684 West Buena Vista, Detroit 27.

(More New Products on page 94)

If you do AC Bronze Welding, check these Advantages

- No snuff outs
- Easy striking
- Wear resistant
- Corrosion resistant
- Welds dissimilar metals
- High strength
- High ductility
- Can be used with AC or DC

You get them all with AMPCO-TRODE* "AC" Coated Aluminum Bronze Electrodes

THESE Ampco-Trode "AC" advantages mean lower welding costs for you—better, faster jobs—less trouble. Besides the advantages listed you also get a smooth bead that feather-edges perfectly into the base metal — whether it's used on cast iron, malleable iron, bronzes, some nickel alloys, or dissimilar metals.

Moreover, Ampco-Trode "AC" beads are free from porosity and surface pitting. Spatter loss is low, too.

Ampco-Trode "AC" is available in 5 grades having Brinell hardness ranging from 135 to 300, tensiles from 77,000 to 90,000 psi, and yield strengths from 35,000 to 69,000 psi.

For additional information about versatile, money-saving Ampco-Trode "AC" electrodes call your nearby Ampco distributor or write us.

*Reg. U. S. Pat. Off.

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NEWS

from page 6

MISS WELDOR OF 1953 is Barbara Nichols, shown above with Rene Wasserman, head of Eutectic Welding Alloys Corp. Miss Nichols' stage-TV name is Agathon

STUDS WELDED on stainless steel extrusion slugs carry them through a furnace and salt bath preheat. During extrusion, heated slugs are lubricated by glass

Thor Power Tool Co. New Name of Independent Pneumatic

STOCKHOLDERS of the Independent Pneumatic Tool Co., Aurora, Ill., have voted to change the name of the company, effective March 17, to Thor Power Tool Co. Neil C. Hurley, Jr., president, stated that the older name no longer was an accurate description of the company operations.

* * *

Welded Studs Carry Slugs in Stainless Extrusion Mill

right photo

HOT billets of tough stainless steel are rammed through dies to produce tubes and shapes in a new extrusion department at United States Steel Corporation's National Tube Division plant in Gary, Ind. Glass is melted in the process to act as a high-temperature lubricant for the dies. A 2,500 ton hydraulic press is included in the new facilities, which employ the French Ugine-Sejournet process.

The press is capable of producing seamless tubing $1\frac{1}{2}$ in. to $6\frac{1}{4}$ in., outside diameter. With present tooling, the maximum size extruded is $5\frac{1}{8}$ in. Using the new facilities, the Gary plant can now produce tubing from non-piercable grades of stainless and unusual shapes that can't be rolled.

Steel billets for the process are supplied by other U. S. Steel mills and arrive in the form of rough-turned and surface-conditioned rounds. These are cut into extrusion slugs. After cutting, the slugs are weighed and in some cases the leading edge is chamfered.

To make it possible to handle the slugs by overhead conveyor, special flux-filled studs of $\frac{3}{4}$ to $\frac{7}{8}$ in. diameter are end-welded to each slug with a stud-welding gun in a special mounting. (See above photo). Cast alloy-steel hangars with slots in them are suspended from an overhead conveyor. The stud is engaged by the hangar slot and the conveyor moves the suspended slug into a three-zone, gas-heated 2,300 F furnace with a slotted roof to permit passage of the hangar necks. From the furnace, the conveyor carries the slug to a 2,300 F salt bath, which completes its heating. The salt bath also coats the billet and reduces any surface scale that has been formed.

After leaving the salt pot, the heated slug is conveyed to a charging buggy. Here the welded stud is severed with an air-driven chisel. The slug drops onto the press charging buggy, which positions the billet in the press. A sheet of glass fiber is placed on the table and wraps around the slug as it rolls into position before the extrusion press. A special air cylinder on the buggy inserts the prepared slug into a section known as the "container." A spacer piece is lowered before the face of the container, the ram is advanced and pressure is applied. Heat and pressure reduce the glass to a viscous liquid which serves as a lubricant as the steel is forced through the die.

Wisconsin Welding Institute Judged Big Success

THE first Welding Technology Institute held at the University of Wisconsin, Madison, Feb. 17-19 was called a big success. The 3-day course of welding studies was completed by 43 enrolled students. Some 300 visitors took in the welding equipment demonstrations and displays. The director of the University's extension division proclaimed this meeting one of the best such educational ventures the school has held. Because of the unusual interest, plans are going forward for another welding institute next year.

After Amscoating with Thermalloy 4, these Piercer Guide Shoes reduced down time and kicked production up.
Composite shear blade of mild steel base metal, hardfaced with Thermalloy 4 on cutting edge. Lower view: part after machining.
Hot trimmer die and punch Amscoated with Thermalloy 4 increased service life, cut costs.

BEAT HEAT WEAR and IMPACT with AMSCO THERMALLOY 4

If you have a wear problem involving high temperatures and requiring resistance to impact, this new Amsco hardfacing electrode can save you time and money

Elevated temperatures are tough to cope with in situations involving thermal shock, metal-to-metal wear, hot gas corrosion, high temperature oxidation—especially when you need great impact resistance. Here's where Amsco Thermalloy 4 can step in and give you longer service life, and big savings in time and money.

Supplied as both a composite coated electrode for electric welding or as a bare cast rod for gas welding, both types deposit a high-carbon stainless alloy containing chromium and nickel as the principle alloying elements. In many applications, it can replace expensive nickel base alloy materials. Thermalloy 4 is packaged in 50-lb. boxes or in 10-lb. packages in 50-lb. boxes. For detailed analyses and other pertinent information, write for catalog sheet on Thermalloy 4 or contact your nearest Amsco distributor.

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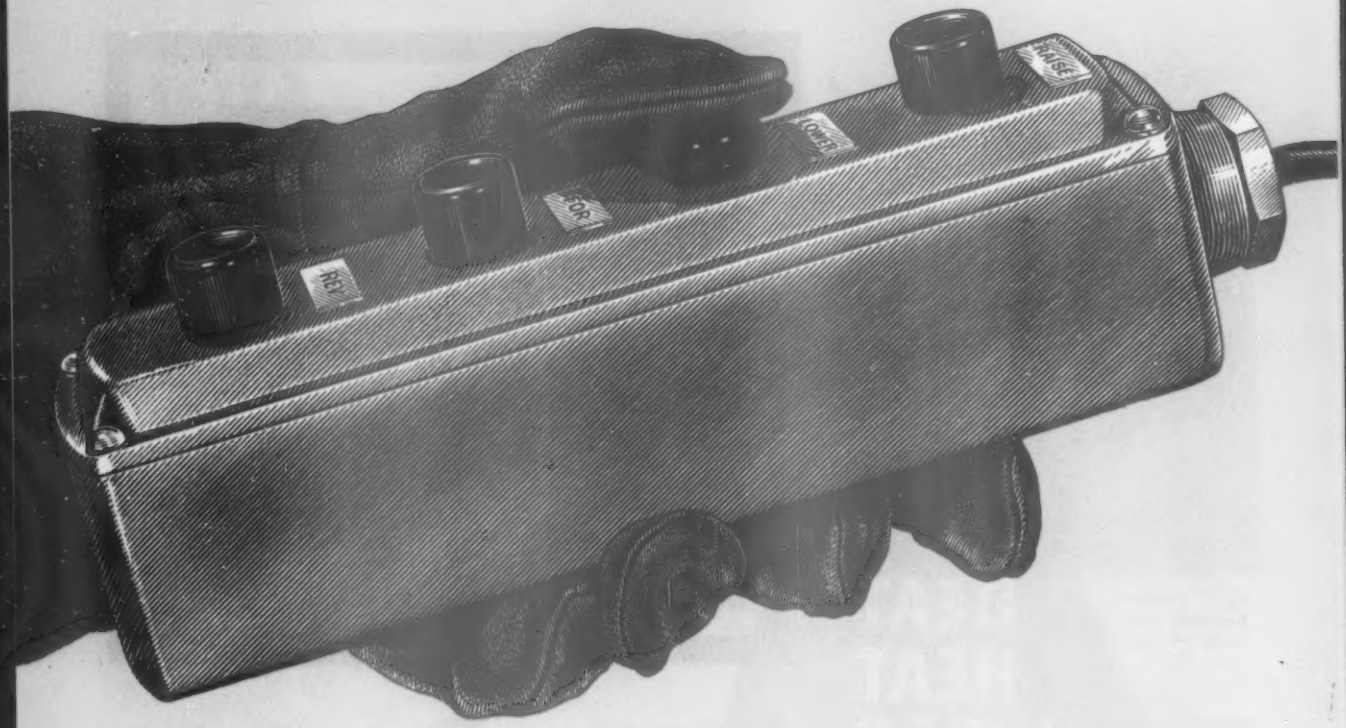
Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que. Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.



One finger is enough

to position heavy workpieces for fast, economical downhand welding

- with P&H positioners

Cut costs as much as 50% — position the weldment, not the operator! A touch of a control button does the work — saves handling time. Welding is downhand — permits using a larger rod for faster deposition. Welds are smooth, uniform. P&H Positioners are available in capacities from 2500 to 36,000 lbs. — remote-control and hand-operated models. Ask your P&H representative or distributor for further information — or write us.

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Oregon to Get Ferro-Nickel Plant

M. A. HANNA Co., Cleveland iron and coal producer, is readying plans to build the first commercial U. S. ferro-nickel plant, near Riddle, Ore. The Defense Materials Procurement Agency signed the contracts with two Hanna subsidiaries, which will bring in production of at least 95,000,000 lb. of nickel by 1962.

Hanna Coal and Ore Corp. will develop the mining property at a cost of $4,300,000 for which it was granted 85% rapid tax amortization by the DMPA. The ore will be bought by DMPA and resold at cost to the Hanna Nickel Smelting Co.

DMPA has advanced $24,800,000 to the latter firm for construction of a ferro-nickel plant. If Hanna is able to fulfill the commitment of 95,000,000 lb. of contained nickel by 1962, $22,000,000 of the advance will be written off. Construction of the plant will start this summer. Ferro-nickel output will actually begin in 1954, with full annual production of 9,000 tons coming in the next year.

Price for the ore will be $6 per dry ton with nickel content of 1.5%; for the ferro-nickel ingot, not more than 79.39 cents a lb. for the first 5,000,000 lb. of nickel produced and 60.5 cents a lb. for the remaining tonnage.

DMPA made a similar deal last year with Canada's Falconbridge Nickel Mines, Ltd., on a marginal nickel operation. Behind the Government's liberal policy on nickel is the grim fact that nickel is still one of the very tight strategic metals (others: cobalt, columbium, tantalum, molybdenum).

The government's nickel goal is a 190,000-ton supply in 1955, including stockpile requirements. This will come almost entirely from imports, and is 89,000 tons more than the 1950 supply in the U. S. Defense mobilization officials already have 113,000 tons of nickel in sight for 1955 with projected production schedules. Despite these nickel expansion plans, there is little chance for relaxation of controls on the metal this year.

* * *

Pacific Metals Clinics Attended by Thousands

VERY good attendance was recorded at the recent series of welding clinics held by Pacific Metals Co., Ltd. in three western branch cities. Both exhibitors and company officials were gratified at the crowds, which numbered 3,000 in Los Angeles, 2,000 in San Francisco and 1,000 in Salt Lake City.

Welding and Brazing Featured in 20th Century Sculpture Show

ARTISTIC renderings from the oxyacetylene torch and the electrode holder were seen among 100 20th-Century sculptures on exhibit in Chicago from Jan. 22 to March 8. Staged at the Art Institute of Chicago, the exhibition was assembled and its catalog written by Andrew C. Ritchie, director of painting and sculpture at the Museum of Modern Art in New York City. The show is now in New York at this museum.

Purpose of the exhibition was to indicate variations in styles and trends conceived during the last 50 years. Sculptures ranged from bronze and marble pieces by Rodin to American contemporary "non-objective" works made with oxyacetylene torch and wire.

Shown in the photo above is a famous sheet iron female figure titled "La Montserrat." About 65 in. high, it was conceived and fabricated by Julio Gonzalez, famous Spanish artist and sculptor who died in 1942. He taught the well-known modern artist, Pablo Picasso, the technique of hammering and welding metal in artistic forms. The figure was lent to the exhibit by the Stedelijk Museum, Amsterdam, The Netherlands.

Daniel Brenner, noted young architect and professor at the Illinois Institute of Technology, Chicago, designed the galleries at the Art Institute that housed the exhibit. He used blue, black and sand colored scrolls, sometimes suspended from the ceiling to isolate certain pieces of sculpture. He hung one musical mobile by Calder from the ceiling and put a 2,500 lb. female nude by Maillol on railroad ties. Altogether, there were 22 works by 18 Americans and 78 works by Europeans from 8 countries.

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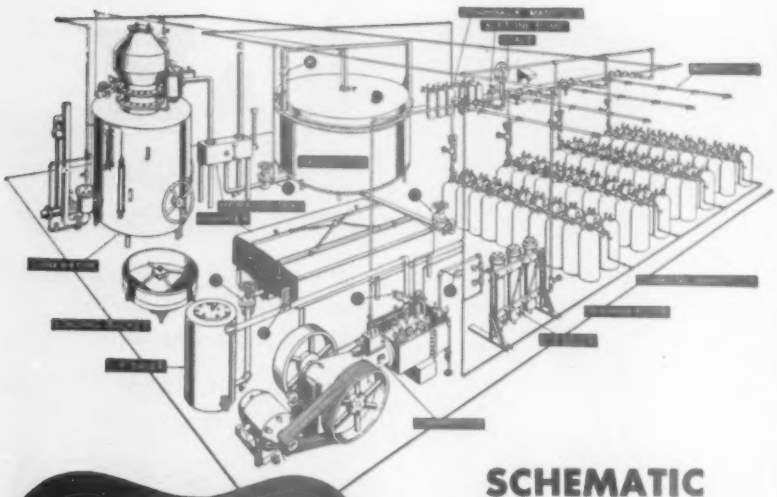

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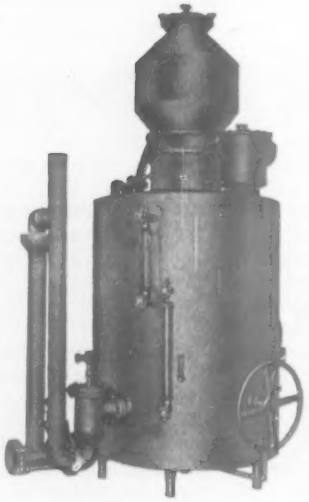
This 600-lb. acetylene generator fits into the above plant assembly. It stands out as one of the safest plants manufactured. Automatic controls minimize operating personnel. Rated capacity of the generator and plant assembly is 2700 cu. ft. per hour. The other units are designed for maximum production at minimum costs.



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Division Lead Buys Eagle-Picher Plant

Joe A. Stone, executive partner of Division Lead Co., Chicago, has announced the purchase of the Eagle-Picher Co. Metallic Products Division plant at Argo, Ill. Equipment and personnel of the new facility will be retained.

Division Lead's present plant at 836 W. Kinzie St. in Chicago is scheduled to become primarily a distribution center, with portions of the space given over to increased industrial research. Most other phases of work will be transferred to Argo, department by department, during 1953. Additional space at Argo is estimated at 100,000 sq. ft., with brick buildings housing both production and warehouses.

Mr. Stone said he intends to enlarge the line of Division lead products and industrial chemicals. The company's west coast representative is Bucky Harris of Standard Wire and Cable Co., 3440 Overland Ave., Los Angeles and its New York representative is the Kenneth E. Hughes Co., 17 West 60th St., New York City.

* * *

Car Bumper Used As Welding Positioner

A 4,000 gallon fuel tank was recently repaired by welding in just three hours. Partly responsible for the speedy job was the neat trick of rolling the big cylindrical tank with an auto bumper so that welding could be all downhand.

Trouble on the tank had started with a frozen pressure relief valve. When oil was pumped into the tank resulting air pressure blew the head off one end of the 18 ft. long tank. Called in to repair the tank, veteran weldor Howard Drake first steamed the tank to remove all fumes. He then pulled the head back into place with a simple cable hoist, according to information from the Hobart Brothers Co., Troy, O. When the head was in approximately the right fit-up, tack welds were spaced about 10-in. apart. Using ⅛-in. diameter E-6010 electrodes, he ran a single bead around the tank to put it back in top condition.

Weldor Drake used his 300 amp. gas engine driven welder and 1-kw auxiliary power generator for lights. The latter was necessary because he had to do the job at night.

Bill to the tank owner was only $40, instead of the $500 needed for a replacement tank. Materials used included 20 lb. of electrodes and 5 gallons of gasoline.

Welding Clinic April 15-17 at Steel Sales in Indianapolis

A 3-day welding clinic will be held at the formal opening of the new Steel Sales Corp. warehouse at 2185 North Sherman Drive, Indianapolis, Ind. It will begin Wed., April 15 and continue through Friday, April 17.

Daily demonstrations of electric arc, oxyacetylene and inert-gas welding as well as aluminum, bronze and silver brazing will be conducted by representatives of nationally-known suppliers. These will include The International Nickel Co., Aluminum Co. of America, American Platinum Works, Crucible Steel Co. of America, Lukens Steel Co. and Driver Harris Co.

Visitors are urged to bring specific welding and brazing problems and questions to the clinics. Open forum discussions and question-and-answer panels will be held each day to introduce new methods and clear up operating problems. Clinics will run from 12 noon to 10 p.m. on Wednesday and Thursday and from noon to 6 p.m. on Friday. The new warehouse has 50,000 sq. ft. of floor space.

* * *

Welding Talks Scheduled at International Engineers' Meeting

PRODUCTION and assembly methods in mechanical engineering will be the theme of the Fifth International Mechanical Engineering Congress to be held in Turin, Italy, from Oct. 9 to 15, 1953. It will be held concurrently with the Salone Internazional della Tecnica so that visitors will be able to see this important exhibition.

The 15 working sessions will concentrate on such subjects as machining, welding, flame-cutting, brazing, foundry methods, forging, punching, bonding, key fixing, clamping, riveting, powder metallurgy, etc.

Participating in the meeting will be mechanical engineers from every country in western Europe including Spain and the Scandinavian countires. Official languages of the Congress will be English and French.

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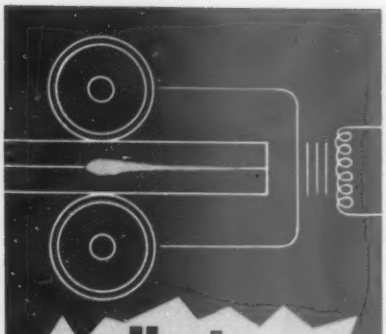

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8-Room Aluminum House Weighs only 2,300 Lb

ALL-aluminum houses are being built for the tropics, particularly South America and India, that weigh only 865 lb. for a two-room dwelling to 2,300 lbs. for an eight-room house with two verandas. Packing case specifications for shipment range from 27 to 39 cu. ft. Called the Kingstrand House, it is fireproof, corrosion-resistant and can take the punishment of hot climates. Simple to erect, it is the result of five years research by Aluminium Laboratories, Kingston, Ont., subsidiary of Aluminium Ltd., Montreal, according to Ward Van Alstyne, president of Aluminum Import Corp., distributor of the Montreal group.

Neither technical or skilled labor is required. Complete instructions and all the necessary tools are enclosed with every house. Walls and roof consist of deeply troughed aluminum sheets that look well and are strong. Where the sheets overlap, they are bolted together along their full length by ¼-in. bolts which are used throughout the construction. Wall and roof sheets are secured together by means of angles; doors and shutters are assembled on site, using sheets of the same profile as the wall and roof sheets stiffened and braced by top hat sections.

In 1950, the Kingston House, predecessor of the current model, was produced commercially for the first time and quantity demand appeared immediately. Some 3,000 were sold in two years and 600 of the units were purchased for use in Karachi, Pakistan.

* * *

New Airco Plant Makes 100 Tons of Liquid Oxygen Daily

THE recently completed Air Reduction Sales Co. liquid oxygen plant at Butler, Pa., has commenced delivery of oxygen to industrial customers. The several million dollar plant supplies oxygen directly to two customers in Butler, Armco Steel Corp. and Pullman Standard Co. They use it to process steel.

The plant, which operates continuously, has a rated capacity of 100 tons of liquid oxygen per day. According to Mr. H. R. Salisbury, Airco president, this makes it Air Reduction's largest such installation.

Argon and nitrogen are also produced at the Butler plant. Most of the argon goes into the inert-gas welding process. Nitrogen provides an inert atmosphere where fire hazard or chemical oxidation must be avoided.

SPATTER CHATTER

Independent Research Proves Superiority of Cam-Lok Connectors

A world-famous manufacturer of welding equipment recently tested Cam-Lok Cable Connectors against competitive connectors. With a 400 ampere load, the Cam-Lok Connector showed only 10.6 millivolt drop, indicating negligible resistance. In comparison, a solid brass bar, the same size and shape as the Cam-Lok Connector, showed 5.8 millivolt drop, proving that the Cam-Lok Connector is almost as efficient as a solid piece of brass.

- Double-Cam principle assures most perfect contact possible
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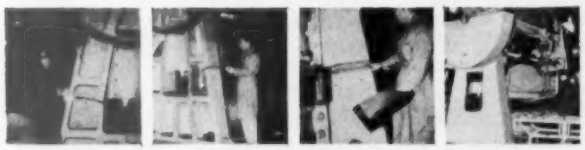

"IMPOSSIBLE" REPAIR AVOIDS TWO YEAR SHUT-DOWN

"The folding press shown in the photos had been in service a great many years and during that time, cracked one leg of the side frame. Temporary repairs were unsuccessful and cracking of two other legs occurred, making the machine unusable.

After various welding companies had decided against repairing this machine by any welding method, we called for a EUTECTIC Consultation and were told that the repair could be made with EutecTrode 24, your special electrode for welding cast iron "cold".

As recommended, we supported the weld repair by boxing in the complete side frame with steel plate and attaching the closely fitted plate to the frame with fitted bolts. The repair made in this manner was completely successful and the machine now operates as efficiently as a new unit.

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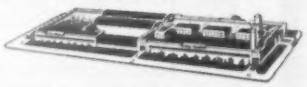

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Basic Materials Conference in New York, June 16-18

TWENTY leading industrial research engineers and government scientists will comprise the advisory committee to formulate a program for the first Basic Materials Conference which will be held in June in New York. It will be held concurrently with the first Exposition of Basic Materials for Industry at the Grand Central Palace, June 15-19.

The heads of 21 major companies have formed a board of sponsors for the show. Chairman of this board is Don G. Mitchell, president, Sylvania Electric Products, Inc.

Chairman of the conference is Theodore C. DuMond, editor, *Materials and Methods*. Committee members include Harry S. Blumberg, chief metallurgist, M. W. Kellogg Co., Jersey City; F. M. Clark, general engineering laboratory, General Electric Co., Schenectady, N. Y.; N. C. Fick, minerals specialist, Washington, D. C.; Annesta Gardner, technical editor, *Modern Industry*, New York; Dr. Zay Jeffries, materials specialist, Pittsfield, Mass.; N. A. Kahn, consulting metallurgist, materials laboratory, New York Naval Shipyard, Brooklyn; W. E. Kingston, director, atomic energy division, Sylvania Electric Products, Inc., Bayside, N. Y.; H. B. Knowlton, chief engineer, materials engineering, International Harvester Co., Chicago; Dr. H. H. Lester, chief, metals research branch, Watertown Arsenal, U. S. Army, Watertown, Mass.

Also, Dr. Clarence Lorig, assistant director, Battelle Memorial Institute, Columbus, O.; John L. McCloud, manufacturing research products office, Ford Motor Co., Dearborn, Mich.; Col. B. S. Mesick, commanding officer, Watertown Arsenal; R. W. Pearson, manager, engineering services and standards, RCA-Victor division, Radio Corp. of America, Camden, N. J.; Thomas E. Piper, staff engineer, guided missile division, Consolidated Vultee Aircraft, Pomona, Calif.; William C. Schulte, chief metallurgist, propeller division, Curtiss-Wright Corp., Caldwell, N. J.; J. B. Seastone, manager, materials division, Westinghouse Electric Corp., East Pittsburgh, Pa., Loren W. Smith, head, metallurgy section, Cornell Aeronautical Laboratory, Buffalo, N. Y.; W. A. Stadtler, manager technical services laboratory, International Business Machines Corp., Poughkeepsie, N. Y. and J. R. Townsend, director, materials and standards engineering, Sandia Base, Sandia Corp., Albuquerque, N. M.

African Violets Shown on Welded Stand

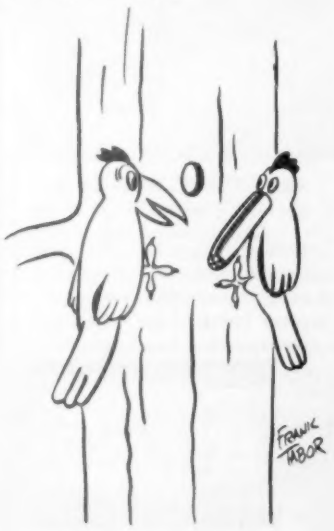
PECULIAR demands of the African violet for water, sunlight and air have provided a nice business for the Vio-Holda Mfg. Co., Topeka, Kansas. This firm offers an all-welded stand with 10 revolving pot-holder arms. The arms at the top of the stand are only several inches long, those at the bottom a foot or so, to give a Christmas tree overall shape. The arms can be revolved to any position so that the plants get air and sun exposure from top to bottom and are easy to reach with the watering can.

Another best-seller for the Topeka firm is a welded aluminum boat 8-ft. long that weighs only 34 lb. It is made of formed 0.032-in. aluminum sheet braced by aluminum tubing welded completely around the gunwales and by welded angles at the side and bottom joints and on the motor mount. The 41-in. wide boat fits into the trunk of a passenger car for easy transportation to small sandhill lakes or potholes where the ducks gather.

* * *

Alloy Rods Names Three Welding Distributors

LATEST additions to the Alloy Rods Co. national distributor organization are the following welding equipment suppliers: Cohoes Welding Works, 157 Saratoga St., Cohoes, N. Y.; Lincoln Welding Supply Co., 330 So. 10th St., Lincoln, Nebr. and Sommerfeld Welding Supply Co., Inc., Oshkosh, Wis. All three will stock the complete Alloy Rods line of stainless and alloy electrodes.



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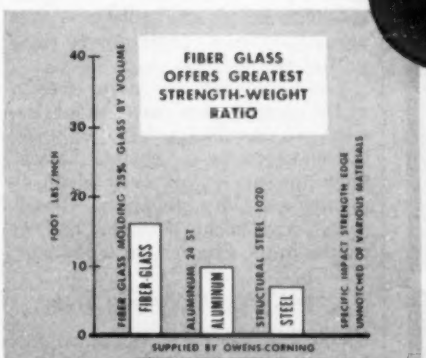

• SAF-I-WELD welding lenses offer sharp, clear definition without any color distortion. Finest optical qualities and unexcelled shade characteristics are made possible by precision methods of individual grinding and polishing. All lenses are identified with shade number markings and are packaged in individual envelopes. They meet all Federal Specifications for acetylene and electric welding. A size for all standard helmets and goggles. A complete line of Cover Plates and Lenses also available.

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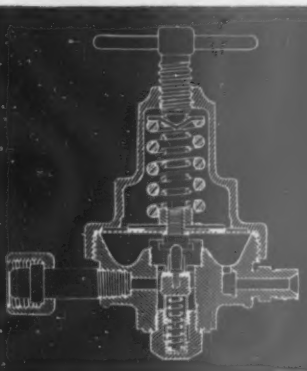

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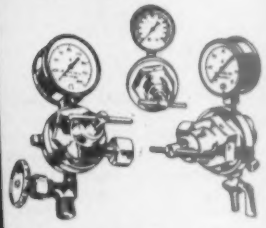

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West Coast Rolling Mill for Harvey Aluminum

PLANS for the construction of the first rolling mill on the Pacific coast for producing aluminum sheets, strips and circular shapes were announced recently by the Harvey Machine Co., Inc., Torrance, Calif. The $20,000,000 plant will be erected as soon as a site is chosen, says Leo M. Harvey, president of the firm.

The new mill is an integral part of the expansion goal set by the Defense Administration to increase facilities for the production and heat treating of aluminum sheets and strips. The entire project will be built by private financing, Mr. Harvey stated.

When the mill is completed, Pacific area manufacturers of aluminum products will be able to enjoy direct delivery from the local rolling mill. Heretofore it has always been shipped from more Eastern plants.

Announcement of plans for the construction of the new rolling mill, coupled with recent news of the aluminum reduction plant to be built in Oregon, highlights the forward strides being made in the aluminum field by the Harvey Machine Co., Inc., which has been in business 40 years. The company is already a large independent fabricator of precision aluminum extrusions for aircraft use and forging stock, shapes, rods and bars for commercial requirements.

* * *

Midwest Piping Changes Company Name

SIMPLIFIED name of the Midwest Piping and Supply Co., St. Louis, is the Midwest Piping Co., Inc. A. G. Stoughton, Midwest's president and chairman of the board, said that the only supply operations the company conducts are in the St. Louis area and constitute a comparatively small part of its business.

For some years the major activity of the company has been the fabrication and installation of piping and the manufacture of welding fittings. Only the name has been changed, pointed out Mr. Stoughton. Ownership, management, personnel and activities of the firm remain the same.

* * *

New Plant for Ungar Electric

UNGAR Electric Tools, Inc., manufacturer of industrial soldering handles, has completed a $200,000 plant on a three-acre site at Venice, Calif. The new 15,700 sq. ft. structure, which will double present Los Angeles facilities, will include office, factory woodshop and machine shop.

REED ENGINEERING CO.

Modern Metalworking Equipment

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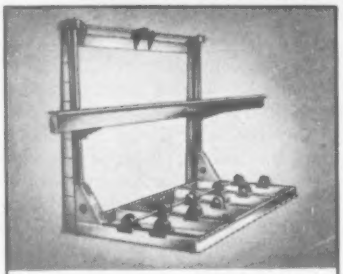
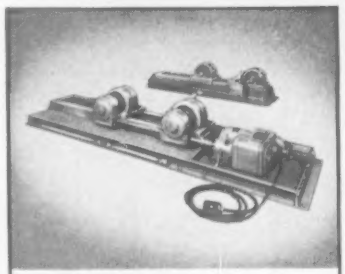
- TURNING ROLLS
- AUTOMATIC WELDING FIXTURES



UNIT TYPE AUTOMATIC WELDING TURNING ROLLS

- ★ Combines adjustable track support and turning rolls into one fixture
- ★ In 5 standard models
- ★ Capacities up to 9 tons, 12 ft. diameters
- ★ Vertical and horizontal powered track adjustment on larger models



REED PORTABLE TURNING ROLLS

- ★ In 5 models; capacities up to 75 tons
- ★ For hand or automatic welding, finishing operations on tanks up to 14 ft. diam.
- ★ Reversible, variable speed adjustment
- ★ Rugged, all-steel construction
- ★ Built-in silent worm gear drive

WE INVITE YOU . . . to write us for specifications, prices, list of REED users near you. No obligation. Just write on your letterhead.

REED ENGINEERING CO.
1007 W. FAIRVIEW, CARTHAGE, MISSOURI

Build up with...

All-State No. 13 Nickel-Silver ☑

Retemper...

None Required ☐

• Dirt Mover Gears and Pinions • Finely Heat Treated • Reclaimed in 14 hr. with 25 lb. All-State No. 13 • Saved $510. net.

• Steam Processer Packing Gland Journal • None reclaimed before • 20 lb. of All-State No. 13 included in $300. overall repair • Saved replacement at $1300.

• Dripless Ball and Cone Valves • Rejections reduced to zero since adopting All-State No. 13 • High resistance to abrasion and galling is imperative.

All-State No. 13 Nickel-Silver Build-up Rod (and the No. 11 Brazaloy Flux that's always used with it) is sold just about everywhere. Over 600 All-State Distributors have it in stock. Write us for names of those near enough to you to be convenient. Ask for "Steel Booklet" to get complete application instructions.

All-State

ALL-STATE

WELDING ALLOYS CO., INC.
White Plains, N. Y.

More Welding Black Eyes In English Report

CARELESS work on the part of welders and supervisors has again succeeded in giving welding a bad name, according to the 1952 report of the Liverpool Underwriters' Association, Liverpool, England. Of 57 fires occurring in ships covered by the report last year, 19 were caused by sparks from gas or arc welding. These ships were all being built or repaired.

Emphasizing the careless angle, the report says that little appears to have been done in most cases to prevent the fires from starting, although most of them were quickly detected and extinguished after trouble had started.

Most essential of all safeguards is the clearing from the welding or cutting vicinity all inflammable materials, particularly dunnage and oil residue. Incredible as it sounds, there have been cases where welding and cutting has been going on aboard oil tankers before all compartments have been freed of gas. Resulting fires and explosions have killed people.

Another recommendation given by the report is to reduce the large area exposed to falling sparks, if at all possible.

—McGraw-Hill World News

* * *

New A. O. Smith Service Branch Opens at Oakland, Calif.

NEWEST service branch of the product service division of A. O. Smith Corp. is at Oakland, Calif. Opening March 1, it is designed to provide a central West coast location for efficient handling of replacement parts, serve and repair and training operations.

The 12,00 sq ft building will serve users of such A. O. Smith products as electric heaters, domestic glass-lined water heaters, commercial water heaters, domestic heating equipment, 1-p gas systems and welding accessories. George A. Carlson will be branch manager. The product service division has other branches at Chicago, Union, N. J. and Dallas.

* * *

Owen Welding Supply Moves

LARGER quarters have been occupied by Owen Welding Supply Co. at 1925-27 West Monterey Ave., (111th St.), Chicago 43. A large display room is available for showing welding supplies and shop tools. The move was made on the fifth year of business as distributors serving Chicago's southern suburban areas and northern Indiana.

DOCKSON'S No 145 OUTFIT

fitted for a complete range of all-purpose welding and cutting operations as heavy as 5" steel.

No. 145 OUTFIT includes:

1—No. 4-E-C Hi-Speed Welding Torch.
1—Ea. Nos. 2, 4, 6, 8 and 10 "E" Style Elbow Tips.
1—C-4 Hi-Speed Cutting Attachment.
1—C-2 Cutting Tip.
1—No. 134-BE Oxygen Regulator, 200 lb. and 3000 lb. gauges.
1—No. 134-AD Acetylene Regulator, 60 lb. and 500 lb. gauges.
1—Commercial to P. O. L. Adaptor.
1—12½ ft. length ¼" Siamese Hose.
4—Hose Connections.
1—Outfit Wrench.
1—Round File Gas Lighter.
1—Pr. Series 66-19-6 Welding Goggles.

THERE IS A DOCKSON DISTRIBUTOR NEAR YOU — Let us send you his name and our catalog of Welding and Cutting Equipment, a complete line "BUILT FOR BETTER SERVICE".

Dockson CORPORATION
3839 WABASH • DETROIT 8, MICH

FREE

Jar of PROTECT-O-METAL No. 2, the smokeless, odorless, non-toxic, spatterproofing compound that lets you wipe off weld-spatter—save 85% of cleaning time and labor. Write for your free sample today!

PROTECT-O-METAL
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G. W. SMITH & SONS, INC., 5408 KEMP RD., DAYTON, O.

BECKER HAS IT OR CAN MAKE IT!

IF IT'S CARBON

KEEN-ARC CARBONS

Cored and heavily copper coated for twin arc torches.

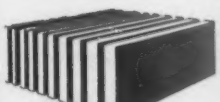
WELDER BRUSHES

The "right" brush for every type and make of welding equipment.

ELECTRODES and RODS

All standard types and sizes.

PLATES



1/4" thickness and up.

PASTE

Heat resistant, easily molded.

PLATES and PASTE ASSORTMENT

$24.50

A handy assortment, developed especially for welding departments or small welding shops.

COMPLETE BECKER ENGINEERING SERVICE is always available and entails no obligation whatever.

BECKER BROTHERS CARBON CO. 3450 SOUTH 52nd AVENUE CICERO 50, ILLINOIS, U.S.A.

Sidney Swan Speaks to AWS-Naval Architect Meeting

"SOME Notes on Ship Repair Welding" was the title of the talk given at the February joint meeting of the New York sections of the American Welding Society and The Society of Naval Architects and Marine Engineers. Presented by Sidney Swan, principal surveyor, New York District, American Bureau of Shipping, it covered such subjects as the role of the individual in welding skill, design details on present-day merchant ships, necessity of good edge preparation and constantly improving co-operation of supervisory personnel with design and engineering people.

He mentioned that new vessels in some areas have vital welds checked with a total of 200 to 1,400 radiographs per ship. Radiography is gaining a foothold in repair work too and is required by some owners, he said. Recent instances of hull cracks in welded ships have been traced to poor repair welding, rather than the original good welding put in at construction.

Continuing attention should be paid to proper welding sequence of shell plates, Mr. Swan remarked. Longitudinal stresses built up by cooling contraction are of considerable magnitude as produced by present-day sequences and might be reduced by further research into the matter.

* * *

Weldwire Expands Electrode Capacity

To meet demands for wound welding wire and coated arc welding electrodes, the Weldwire Co., Inc., has acquired additional plant space at its present location at Emerald and Hagert Sts., Philadelphia 25. The added space will increase production in the specialized spooling of pure aluminum, aluminum alloys, stainless steels and specialty steels for the inert-arc welding proces.

* * *

50,000 and 35,000 Ton Presses Coming to Alcoa at Cleveland

OFFICIALS of the Air Force and the Aluminum Company of America have completed negotiations on a contract that will bring a 35,000 ton and a 50,000 ton capacity duo of forging presses to the company's Cleveland works. To be as large as any in the world, they will go into operation in 1954.

The 50,000 ton press will have an overall height of 80 ft, 36 of this below ground level. The 35,000 ton press is 38 ft wide, 65 ft long and will tower 49 ft above the ground.

127 Delegates Visit San Francisco NWSA

THE biggest number of delegates (127) ever recorded at a western zone meeting of the National Welding Supply Association met Feb. 5 and 6 at San Francisco's Mark Hopkins Hotel. In charge of the meeting was Elmer Bakke, zone vice-president.

First speaker at the opening session was NWSA president G. Milton Sims, who greeted the visitors. Harry Moore, Moore's Welding Supply, Sacramento, lead a discussion on warehouse improvements. E. A. Daniels, Victor Equipment Co., presented a talk on the future of the welding industry.

Homer E. Christner, Welders Supply Co., Los Angeles, opened Friday's meeting with a review of his firm's revised purchasing procedures. Remainder of the morning was spent viewing the NWSA slide film on various display attractions used by welding dealers.

Fred L. Beelby, western divisional manager of The Stevens-Davis Co., Los Angeles, delivered a talk on "Selling Today" after the Friday luncheon. Willis H. Stanfill, Welders Supply Co., Portland, Ore., then led a discussion on the importance of safety care and worker protection. Ted Cox, Ted Cox Welding Supplies, San Bernardino, covered the relative merits of leasing versus owning trucks and rolling stock. James N. Alcock, Saginaw Welding Supply Co., Saginaw, Mich., presented to the meeting a report on NWSA efforts to develop specifications for a standard catalog page.

The following six firms signed membership applications at the meeting: California Oxygen Co., Town & Country Branch-Box 37, Sacramento, Calif.; Gardner Welding Supply Co., 504 Lakeside Ave., Coeur D'Alene, Idaho; Welders Service, Inc., 1376 N. Larrabee St., Portland, Ore.; Industrial Equipment Co., 2714 Broadway, Everett, Wash.; Key Equipment Co., 6323 San Pablo Ave., Oakland 8, Calif. and Balaam Brothers, 1421 Park Ave., Emeryville, Calif.

* * *

Industrial Tubes Marks First Year of Business

INDUSTRIAL Tubes, Inc., Geneva, Ill., has ended its first year of business and first eight months of actual production, announces John H. Hutchings, president. It occupies a new, one-story modern factory building specially designed for the production of industrial electronic tubes. Production has risen steadily during the past seven months.

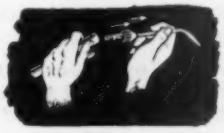
YOU CAN DO ALL OF THESE JOBS!

It's amazing how *versatile* Smith Welding Equipment is. That's because Smith's ingenious design permits quick attachment of accessories for special purpose work. All accessories fit one torch body. Insert one tip—and weld. Insert Cutting Assembly—and do cutting.

No wrench necessary—fingers do the job. For Smith's Lifelong Heavy Duty Torch Body, there are 10 different accessories for as wide a variety of work as a normal shop would ever be called upon to produce. Other Smith torches have similar versatility. Tips can be changed in 6 seconds. Standardize on Smith for efficiency. Write for information.

General welding and brazing
General cutting, gouging, and rivet cutting
Soldering: — flame and iron types
Lead burning
Special heating
Hard facing
Cylinder welding
Pipe welding
ETC.

Plus All These Technical Advantages



CHANGE TIPS IN 6 SECONDS

No wrench necessary. Easy twist of fingers does the job —makes gas-tight seal. Fast line-up of tip. Fast change from welding to cutting.

ROTATE TIP WHILE FLAME IS BURNING

Don't shut off the flame—just turn tip to any angle you want and go on with your work. No delays. Saves time—keeps production rolling.

NO TROUBLE WITH BURNED-OUT SEATS

Ingenious new Smith "Flotrol" prevents reverse flow of acetylene, protects torch against back fire and burned-out seats.

MAIL COUPON TODAY FOR DETAILS

SMITH WELDING EQUIPMENT CORPORATION
Manufacturers of fine Welding Equipment for over 40 Years

Smith Welding Equipment Corp.
2634 S. E. 4th, Minneapolis, Minn. Dept. WE-53

Please send me more information on the time-saving and money-saving features of your new torch.

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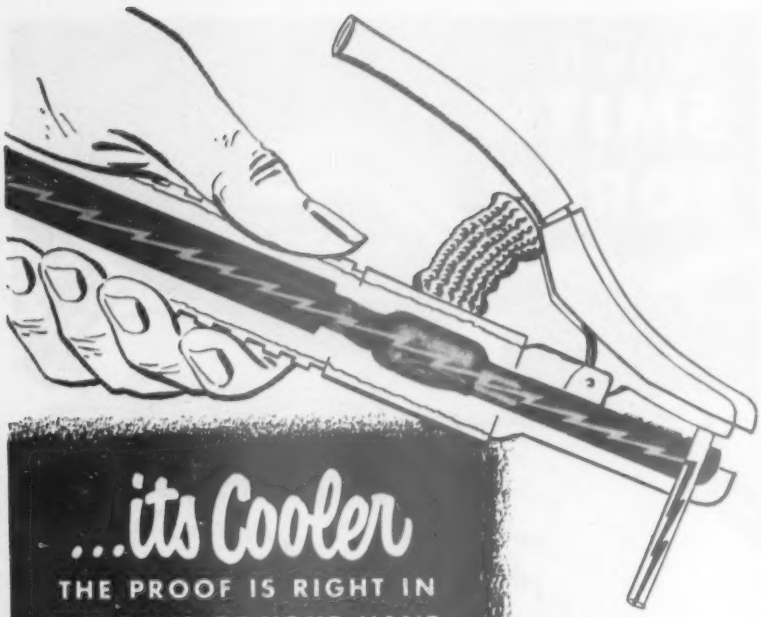
Address_____
City_____ State_____



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CADDY®

ELECTRODE HOLDER

FULLY INSULATED MODELS

500 AMP

400 AMP

300 AMP

OTHER MODELS ON REQUEST

FEATURES:

- CADWELD connection—cable to jaw is a 100% conductivity solid copper connection. It is permanent—cannot melt out, burn out, loosen or corrode.
- Short completely replaceable beryllium copper jaw has 80% conductivity.
- Lightweight durable steel body carries no current.
- Cable gripper prevents broken strands and flexing at the connection.
- Operator's hand is over fully insulated cable, air space and handle ribs.
- Fiberglass spring cover withstands 1200° F. heat radiation from the arc.
- NO Shocks—Handle screws eliminated.
- Replaceable fiberglass insulators.

"CADDY" ARC WELDING ACCESSORY DIVISION

ERICO PRODUCTS, INC. • 2070 E. 61st PLACE • CLEVELAND 3, OHIO

Clinic at Scottsbluff, Nebr., Bowed, Not Beaten by Blizzard

MID-WINTER snowstorms in western Nebraska didn't stop the Feb. 18-19 welding clinic staged by Harrington Welding Co. of Gering and Scottsbluff, Nebr. The first day, Feb. 18, was fairly clear and 225 visitors came to see the welding booths and demonstrations. But the second, Feb. 19, everybody was greeted by a blinding snow storm. Winds of 60 mph blocked highways and streets. Even so, a few welding men from the locality came to the show.

The second day's lull in demonstrations gave the factory representatives a good chance to become better acquainted with each other, and with their hosts, Andy and Mrs. Harrington and their son Ivan, who run the welding supply firm. Both Andy and Ivan ran a successful job shop in Gering for some years.

Demonstrators included Bob Bercaw of Hobart Brothers, Ernie Wheeler of Shawinigan Products Corp. and Amos Johnson of the Stoody Co. All demonstrators showed practical methods of welding farm machinery, hardfacing certain parts or generating acetylene at home.

The Harringtons also handle Balbach Co. gases, Sight Feed generators, National Welding Equipment, Tweco Products and other welding accessories.

Visitors included a group of students from the vocational agriculture class at Minatare, Nebr.; C. R. Christopher, maintenance superintendent, The Texas Co., Casper, Wyo.; Joe Miller, Graver Tank Co., Casper, and shop operators from Sterling, Colo.; Kimball Nebr.; Oshkosh and Alliance, Nebr. and other areas of the Platte valley.

* * *

Cleaning, Grinding Discussed in Government Leaflet

SMALL Defense Plants Administration has announced the issuance of two new "Technical Aid" leaflets, No. 18 on "Surface Cleaning Techniques," and No. 19 on "Care and Maintenance of Grinding Wheels." They are also available free on request from SDPA field offices.

The surface cleaning booklet outlines methods of cleaning various types of steel, copper alloy, nickel alloy, aluminum, and magnesium castings before they are painted or given other protective or ornamental coatings.

The leaflet on grinding wheels discusses the various factors affecting the efficient use of them, such as undue stresses, surface speeds, wheel balance, chip disposal or overloads.

Tucson, Arizona, Weldors Form AWS Section

JOSEPH A. Pruitt was elected chairman pro tem of the newly formed Tucson section of the American Welding Society at a meeting Feb. 3. He will serve until the first regular election in May.

Charter members of the Tucson section totaled 63, making it one of the largest in the Rocky Mountain area right off the bat. More members are expected in the next several months.

Following are the officers who will serve with Pruitt until May: Oliver M. "Mutt" Golay, first vice-chairman; W. C. "Prof" Curry, second vice-chairman and a teacher at the University of Arizona; Charles Condron, treasurer and George Hunt, secretary. Hunt is head of the welding department at Tucson Vocational High School. Pruitt is sales manager for the Tucson branch of Arizona Welding Equipment Co.

Principal speaker at the first meeting was E. C. Rogers, chief metallurgist for the Stoody Co., Whittier, Calif. He talked on aspects of metallurgy involved in hard-facing and used colored slides for illustration.

Charles A. Babbitt, vice-president of Cal-Metals, Torrance, Calif., newly elected vice-president of district 7, AWS, attended to assist in the formation of the new section.

Much of the organizational work for the new section was done under the direction of Don McCowan, a past chairman of the Peoria, Ill., section. McCowan pointed out that the Tucson section can expect support from an area within a 75-mile radius including many large mining and smelting companies, construction outfits and job shops.

* * *

Lead Lining Simplified By New Process

AUTOMATIC lead-cladding from a "kiss" to any desired thickness is claimed for a new machine made by Knapp Mills, Long Island City, N. Y. Said to be the only one of its kind, the machine weighs 15 lbs and normally runs on a rail above the work. It will spread the lead over a surface 12 inches wide.

The process requires the steel to be in a flat position. The surface must be first cleaned of scale and grease and then painted by hand with a thin coating of a special liquid. The machine travels back and forth to bond the lead and can carry its own supply. The operator can reverse the bottom carriage and place the track on the plate next to the path of the machine.

Colmonoy No. 1 Hard-Facing Outwears Manganese Steel

Tough manganese steel is used to make parts that must really take rough use. When these parts wear beyond usability, they are often rebuilt with nickel manganese steel alloy. This has been a good practice to give worn parts a new service life equal to their original life.

It is a much better practice, however, to give worn manganese steel parts 2½ to 3 times their original service life by using nickel manganese plus hard-facing with Colmonoy No. 1 electrodes. While manganese steel has good impact resistance, it doesn't compare with Colmonoy No. 1 in resisting abrasion, and abrasion always accompanies impact.

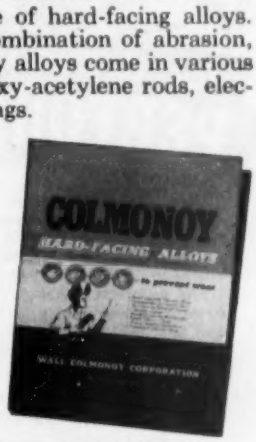
With shock absorbing manganese steel as the "core" of the part, and abrasion resistant Colmonoy No. 1 as the protective "case" of the part, a maximum service life is assured users of manganese steel equipment.

Colmonoy No. 1 is used extensively on carbon steel parts as well. It is a low priced electrode that is easy to apply. Any weldor can put it on. Let us send you our descriptive pamphlet No. 102, and our Engineering Data Sheet No. 23.

Colmonoy stands for a complete line of hard-facing alloys. Each alloy is resistant to a certain combination of abrasion, corrosion, impact, and heat. Colmonoy alloys come in various forms to suit different applications: oxy-acetylene rods, electrodes, paste, powder, wire, and castings.

Colmonoy Hard-Facing Manual

This new manual will make good hard-facing easier for you to do. It gives the characteristics of all Colmonoy alloys, typical jobs on which they are used (in every industry), full information on the Sprayweld Process, castings, finishing methods, etc. The manual was printed for you . . . write for yours today.



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You are Cordially Invited
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Steel Sales Welding and Metal Show

Formal Opening of our Indianapolis Warehouse

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PERFORMANCE

"FLUXINE" Fluxes are the result of over fifty years of scientific research into the metal-joining field. There are 28 FLUXINE Fluxes . . . one for every welding, silver soldering, brazing, and soft soldering operation . . . each with its own properties, designed for a particular metal-joining operation. All have been perfected not only for highest efficiency, speed, and long life, but for economy and safety as well. FLUXINE Fluxes produce no injurious fumes to irritate eyes or nose of the operator.

Write on your company letterhead for a generous sample stating which FLUXINE Flux you desire.

KREMBS & COMPANY
(Est. 1875)

Dept. J, 669 W. Ohio St., Chicago 10, Ill.

No. 28H FLUXINE for gas, hydrogen, argon arc or helliarc welding of stainless steel and inconel.

No. 43 FLUXINE — non-glaring, used when low-melting silver solders are specified. No injurious fumes. Goes further.

No. 44 FLUXINE—a concentrated paste for copper brazing.

No. 47 FLUXINE. New — highly concentrated — for silver soldering, aluminum, bronzes, beryllium copper.

No. 88 FLUXINE is a concentrated fluid with powerful cleansing action. For soft soldering stainless steel and all nickel chrome alloys.

No. 89 FLUXINE for tinning and soft soldering, soluble in water, 1 lb. makes 1 gal.

FLUXINE
TRADE MARK REGISTERED U. S. PAT. OFF.

FLUXES TO JOIN ALL METALS

McCoy Acts On Control Relaxation

RECENT moves by H. B. McCoy, acting head of NPA, carry out policies on relaxation of controls announced by the Office of Defense Mobilization. McCoy said that manufacturers of Class B products are being notified not to file CMP-4B applications for controlled materials for the third quarter of 1953. Also, they are not to submit applications for supplemental allotments for the second quarter of the year, except for defense requirements.

These moves, said Mr. McCoy, are closely tied to the issuance of Direction 20 to CMP Regulation 1 and Direction 10 to Revised CMP Regulation 6. Effect of the directions is to modify the CMP procedures to permit controlled materials producers to accept "unrated" orders for controlled materials after the beginning of lead time, calling for delivery after February, 1953. These directions also establish rules under which controlled materials producers and distributors may ship such materials against orders not covered by an allotment number.

For instance, Direction 10 to Revised CMP Regulation 6 provides a procedure under which owners and contractors may obtain controlled materials for use in construction projects without the use of an authorized order after the beginning of lead time for deliveries after February 1953. Such persons, under the new direction, may commence or continue construction without an authorized construction schedule.

McCoy emphasized that the Controlled Materials Plan as well as all other existing NPA regulations and orders remain in effect, except as modified, through June 30, 1953.

* * *

Sierra Oxygen Co. Boosts Oxygen Output

A CERTIFICATE of necessity from NPA to double its output of oxygen and permit manufacture of liquid oxygen has been received by Sierra Oxygen Co., Reno, Nevada. Cost of the project will be $102,457. The company also makes nitrogen and acetylene and handles welding equipment and supplies. It has recently added a new 10,000 psi. compressor.

Besides individual welding shops and hospital in the Reno area, the firm supplies oxygen to Fallon Naval Air Base, Hawthorne Naval Ammunition Depot, Sierra Ordnance Depot and Anaconda Copper mines at Yerington, Nev.

Primary Copper Producers Want Controls Dropped

REMOVAL of allocation controls over copper raw materials when price controls are lifted was recommended early in March by the Primary Copper Producers Industry Advisory Committee at a meeting with NPA.

The committee recommended unanimously that price controls be dropped immediately on all copper and copper products. Members of the group said the recent revocation of price control on copper scrap without a similar action on domestic refined copper is creating a terrible mixup.

Concerning what should be done after June 30, when material controls expire under the present Defense Act, the committee said any priority band established for military orders should not include refined copper.

NPA men pointed out that second quarter 1953 allotment tickets must be honored before unrated orders can be accepted for copper and copper base alloy products, and it is the responsibility of the Copper Division to make this possible.

At the same meeting, members expressed confidence that copper supplies after discontinuance of price and allocation controls will be sufficient to support both military and civilian demands, despite prospect of a multiple pricing situation.

* * *

Central Argon Storage Saves Money at Ryan Aeronautical

A NEW central storage system for argon gas used in inert-gas welding is expected to save time and money at Ryan Aeronautical Co., San Diego. From a centrally-located cluster of storage cylinders, some 3,800 ft of ¾ to 1¼-in. pipe will fan out to every section of the plant. The gas piping will be laid in trenches until it reaches the building, then will be installed overhead to feed down into the welding booths. Heretofore, all such welding at Ryan involved handling of individual cylinders with consequent cumulative waste and time loss.

* * *

Atomic Information Group Elects Kirkpatrick Head

THE Atomic Energy Commission's Advisory Committee on Industrial Information elected as its chairman S. D. Kirkpatrick, vice-president of the McGraw-Hill Book Co., in a meeting held recently at the Brookhaven National Laboratory, Upton, Long Island.

There's muscle easing balance in all four models of Gasweld torches from the zephyr-light Featherweight Torch to the rugged heavy duty Pacemaker.

BALANCE—that makes it easy to handle long jobs—that cuts down fatigue—that steps up output.

That's just one of the features of this outstanding line—get the full facts—write for Catalog No. 5026 covering the full line of the famous "Gasweld" welding and cutting equipment.

Liquid also produces Oxygen, Acetylene and other commercial gases including CO_2 in all its forms—Gas, Liquid or Solid (dry ice) for industrial use.

THE LIQUID CARBONIC CORPORATION
INDUSTRIAL GAS DIVISION
3110 South Kedzie Avenue, Chicago 23, Illinois

Gentlemen:
Please send me your new Catalog No. 5026 of welding and cutting equipment and supplies.

The Liquid Carbonic Corporation, Industrial Gas Division
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CLEANING BEFORE SPOT WELDING ALUMINUM

Improve quality of welds!
Increase number of spot welds before tip cleaning!
Prolong life of electrode tips!
Eliminate tedious, expensive mechanical cleaning!

DIVERSEY Pre-Welding Treatment for Aluminum

DIVERSEY no. 36 CLEANER

DIVERSEY no. 514 DEOXIDIZER

If you are looking for improved spot welds, increased production and lower costs, it will pay you to investigate the famous Diversey Pre-Welding Treatment for aluminum now . . . it's practical, proved superior, easy and surprisingly economical to use!

Diversey Pre-Welding Treatment is possible because of two outstanding Diversey developments . . . No. 36 cleaner for removing identification markings, grease and soil; No. 514 deoxidizer for removing oxide and heat scale!

A Diversey D-Man will be happy to show you the advantages of Diversey Pre-Welding Treatment for aluminum! No obligation! Write today! Complete information is available!

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1820 Roscoe Street • Chicago 13, Illinois
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Lakeshore Road, Port Credit, Ontario

NEW PRODUCTS

(Continued from page 75)

Flexible-Shaft Truck

258 A NEW hand truck with wheeled rear axle and front skids provides maximum portability for Strand flexible-shaft grinders. It cuts down the chances for damage to the machine caused by operators dragging it about by the flexible shaft.

The machine motor is mounted in a yoke on the deck of the truck, which is easily moved when the handles are pressed down to lift the front skids from the floor. A fixed clamp on the handle holds the handpiece and tool on the end of the flexible shaft. Using the yoke mounting, the grinder can be turned a full 360 degrees. The unit shown is a "Strandflex" 4-speed gear-driven model.

FRANKLIN BALMAR CORP., N. A. Strand Div., Woodberry, Baltimore 11, Md.

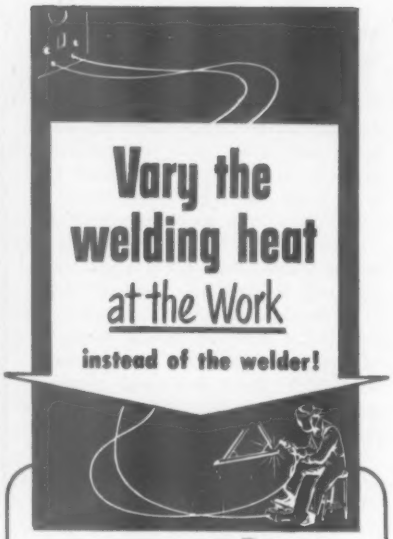
* * *

Torch Seating Rings

259 NEW, "Gas-Tite" servene seating rings are featured on a new NCG welding torch mixer. The gasket type seating permits the mixer to be attached to the torch handle without using a wrench. The mixer fits the standard NCG Torchweld handle. The special seating rings have also been applied to a new model of the flame-cutting attachment for the same torch handle.

Advantages claimed for the gasket-type seating are leakproof connections, longer life for mixer and cutting attachment and lower maintenance cost because the rings can be replaced cheaply. Most benefitted by the new apparatus, according to NCG, will be men whose work involves switching welding and cutting attachments to the same torch handle.

NATIONAL CYLINDER GAS CO., 840 N. Michigan Ave., Chicago 11.



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ARCTROL

Provides *portable* voltage control at the work; selects the exact welding heat for every job *without walking back to the welder!* Retains full welder heat range; saves hours; makes better, more uniform welds. *Handiest aid any welder ever had*—for precision welding, for production jobs!

Available for most makes of D.C. arc welding machines. Write for descriptive ARCTROL circular, giving make and model number of your welder!

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Electrical Manufacturing Co.
2300 East 27th Street, Los Angeles 58, California

Lightweight X-Ray Set-Up

260 NEW portable X-ray equipment for use in shipyards and in the field includes three major components, the X-ray head, the control and the power chassis. The head is light enough to be carried by two men and may be used several ft from its power source and as much as 50 ft above its cooler. It will fit through an opening 15 in. square.

The control is small and light enough to be carried by one man and can be used several hundred ft from the head. The power chassis contains rugged, easily maintained frequency conversion equipment, a cooler and necessary storage space for feeders, cables and water lines. The control and X-ray head can be placed on the power chassis, in turn mounted on sturdy casters, so that all three components can be moved as a single unit.

Over 3-in. of steel can be radiographed with the 250 kv X-ray head with excellent detail. Its 150-lb. weight makes carrying easy. Insulated by gas, it will shut itself off should the gas pressure fall below a safe level or get too high. Cables and water lines can be connected quickly.

PICKER X-RAY CORP., 25 So. Broadway, White Plains, N. Y.

* * *

261 NEW 400-AMP single-phase a-c welder has 60% duty cycle rating. Designated G-E type WK40K, it provides a current range of 40 to 500 amp and can be used with a number of electrode sizes in repair, maintenance and construction work. General Electric Co., Schenectady 5, N. Y.

YOU CAN TEAM UP
A GB SILVER BRAZING
ALLOY AND FLUX
TO GET
PERFECT RESULTS!
NO MATTER HOW YOU HEAT...
The method of heating for low temperature brazing is a decided factor in the selection of the right silver solder and flux. Specify GB and you're right, because you'll get a combination that was made to work right!
OXY-ACETYLENE
INDUCTION
AIR-GAS
SALT BATH
BUNSEN BURNER
OXY-HYDROGEN
OXY-PROPANE
OXY-CITY GAS
CARBON TONGS
RESISTANCE
FURNACE BRAZING
CHARCOAL
BLOW PIPE
GB's line of six standard silver solders offers a range which meets standard production methods. When special solders are required, GB's Technical Service Division offers assistance which is based on experience in alloying and refining precious metals that goes back more than 80 years.
GB Standard Silver Solders
GB No. 50 Silver Solder, melting range 1160-1175°F
GB No. 50N Silver Solder, melting range 1240-1260°F
GB No. 45 Silver Solder, melting range 1125-1145°F
GB No. 41 Silver Solder, melting range 1125-1160°F
GB No. 35 Silver Solder, melting range 1130-1270°F
GB No. 31 Silver Solder, melting range 1130-1300°F
GB FLUXES
The physical properties and appearance of a brazed joint are controlled to a large degree by the flux which is used. For this reason it will pay you to team-up GB Flux with GB Silver Solder — they were developed to produce maximum results when used together.
GB DATA BOOK
Here's real factual data on all of the important phases of low temperature brazing. You can get a free copy from your GB Distributor — Write us and a copy will be forwarded to you.
GOLDSMITH BROS. SMELTING AND REFINING CO.
1304 W. 59th Street, Chicago 36, Illinois
Suppliers of Precious Metals to Industry Since 1867

Tempilstik°

the amazing Crayons that tell temperatures

A simple method of controlling working temperatures in:

- WELDING
- FLAME-CUTTING
- TEMPERING
- FORGING
- CASTING
- MOLDING
- DRAWING
- STRAIGHTENING
- HEAT-TREATING IN GENERAL

It's this simple. Select the Tempilstik° for the working temperature you want. Mark your workpiece with it. When the Tempilstik° mark melts, the specified temperature has been reached.

$2 each — gives up to 2000 readings

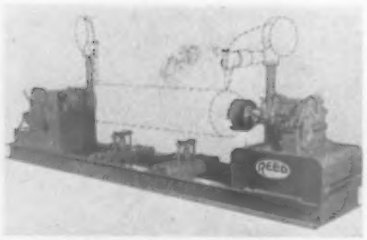
Available in these temperatures (°F)

113	263	400	950	1500
125	275	450	1000	1550
138	288	500	1050	1600
150	300	550	1100	1650
163	313	600	1150	1700
175	325	650	1200	1750
188	338	700	1250	1800
200	350	750	1300	1850
213	363	800	1350	1900
225	375	850	1400	1950
238	388	900	1450	2000

Also available in pellet or liquid form.

FREE —*Tempil° "Basic Guide to Ferrous Metallurgy"* — 16¼" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

Tempil° corp.
11 WEST 25th STREET
New York 10, N.Y.



Girth Welding Fixture

262 NEWEST addition to the Reed line of special welding fixture is a combination assembly press and girth seam welding machine. It is useful in the assembly and automatic welding of water heater tanks and similar light vessels.

The fixture, known as Model AW-205, handles tanks up to 24-in. in diameter, 7 ft. long and weighing up to 4,000 lb. It features a 5-ton assembly force for pressing the tank heads on the shell ends and two air-operated kick-out devices for rapid spotting and removal of the vessels. The headstock has a 10 to 1 variable speed range.

THE REED ENGINEERING CO., 1003 West Fairview Ave., Carthage, Mo.

* * *

Big Heating Torches

263 Two new jet "superheating" torches can be used for preheating, bending, thawing, tar melting, weed burning and descaling.

Model B-1 is a lightweight torch weighing only 3 lb. for its 40¼-in. length. The torch operates from any standard propane tank. Fuel consumption is 15 lb. per hour. Model B-2 is for heavier work and weighs 5¼ lb. for its 46 in. of length. It operates on liquid gas by inverting the tank or using a tank equipped with dip tube. It consumes 23 lb. of propane or butane per hour. It produces 600,000 Btu per hour.

WELDIT, INC., 990 Oakman Blvd., Detroit 6.

For Permanent Good Results in Welding

METAL BOND
SOLDERING AND WELDING
PRODUCTS

- TINNING COMPOUND—cleans and tins in one operation
- SOLDERING SALTS—takes place of acids—fast cleaner
- HARD METAL—for scored cylinders and cast iron soldering
- ALUMINUM SOLDER—for cast or drawn aluminum and die-cast metal
- MOULDOUGH—for backing up job to weld against
- BRAZING FLUX NO. 10—for brazing all metals
- SPECIAL NO. 31—cast iron brazing flux
- ALUMINUM WELDING FLUX—for cast or drawn aluminum
- SEAL-X-O—for filling pin holes in electric welds
- CAST IRON WELDING FLUX NO. 4—also All Steel Wire Brushes and Rod Holders

Try them yourself—find out why they are so widely used. Our handy-size catalog will give you helpful advice—send for it!

METAL BOND MFG. CO.
3201 KOSSUTH AVE.
ST. LOUIS 7, MISSOURI

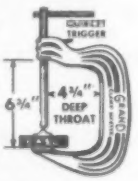
GRAND

SPEED CLAMPS

A S L SERIES

SAVE MINUTES ON EVERY CLAMPING OPERATION!

Grand Speed Clamps are quick setting and instant releasing—just push down the screw and tighten with a turn on the vise-type handle. Trigger releases work instantly.



Grand Speed Clamps have extra deep throats—are ruggedly built of NACO No. 6 Steel—spatter proofed.

4 Sizes: 2" to 8" Opening

Famous GRAND "C" Clamps

Alloy Steel (Stronger than forged) Spatter-Proofed Screws, Deep Throat—Replaceable Swivels

LIGHT SERVICE SERIES	MEDIUM SERVICE SERIES	HEAVY SERVICE SERIES
L SERIES	ASM SERIES	ASH SERIES
8 SIZES 2" TO 12"	7 SIZES 4" TO 18"	8 SIZES ¾" TO 12½"

Ask Your Supplier

GRAND SPECIALTIES CO.
3101 W. GRAND AVE., CHICAGO 22

Fully-Insulated Holders

264 NEWLY-designed Caddy "Type B" fully-insulated electrode holders of 300- and 400-amp. ratings are said to be the coolest operating, highest-conductivity holders available. The welding cable is carried through the holder body and attached to a replaceable beryllium copper jaw by means of a Cadweld solid copper connection that cannot be overloaded, cannot melt out or burn out. This solid copper connection eliminates the normal "hot spot" caused by less efficient joints, says the company.

The operators hand is over insulated cable, air space and ribbed handle, actually 4 to 6 in. from the connection. An 80% conductivity at the electrode is said to be more than twice that of other holders. The current carried by the cable goes directly to the copper jaw. Dispensing with the copper holder body saves from 4 to 7 oz. of weight, reducing the 400 amp. model to 19 oz., the 300 amp. to 18 oz. A cable gripper at the rear of the steel body prevents flexing and twisting of the cable.

ERICO PRODUCTS, INC., 2070 East 61st Place, Cleveland 3.

* * *

New E-6010 Electrode

265 AN improved type E-6010 electrode has been brought out by Metal and Thermit Corp. Called Murex Type R, it has been tried with good results and excellent acceptance on such jobs as power piping, barge and tug boat construction, general fabrication of tanks and cylinders, oil pipe lines, shop work and repair welding. Weldors have commented on its small amount of spatter, uniformity of arc behavior, lack of spearing, ability to take high currents without coating breakdown and penetration without undercutting. There is said to be no reaction pitting when using the whip technique.

METAL & THERMIT CORP., 100 East 42nd St., New York City 17.

P&H
economical
Handy, small-package assortment of electrodes
for repair and maintenance welding
P&H
Maintenance
Pack
7 different electrodes
(Approximately 27 lbs.)
★ AC-3, 1/8", 5/32", 3/16" — For all position welding of mild steels and sheet metal. AC or DC.
★ AC-1, 5/32" — For mild steels. AC or DC.
★ 70LA2, 5/32" — For high-carbon, alloy, high-sulfur, free-machining, cold-rolled, and other hard-to-weld steels. Ideal for steel casting repairs. AC or DC.
★ Harstain, 1/8" — For spring steels and stainless steels of all kinds. AC or DC.
★ Nicast, 1/8" — For machinable welds on cast iron. Nicast welds are strong and non-porous.
$13.90
for complete assortment
Why buy seldom-used electrodes in quantities larger than you need? Now, in one convenient package, you can keep some of each type on hand economically — and get replacement packages as you need them.
The P&H Maintenance Pack equips you to do all kinds of repair and maintenance jobs with the right electrode. All rods are packaged to stay dry — and are clearly labeled to make selection easy.
Be ready for emergencies. Save time, trouble, money. Order a P&H Maintenance Pack from your P&H representative or local distributor. If you don't know who he is, write for his name.
P&H WELDING DIVISION
HARNISCHFEGER
CORPORATION
4513 West National Ave., Milwaukee 46, Wis.
2497
the P&H line

Now

YOU CAN USE

ONE FURNACE

for

Acetylene or Propane

GENCO Model No. PF #2

CAN BE CONVERTED IN SECONDS!

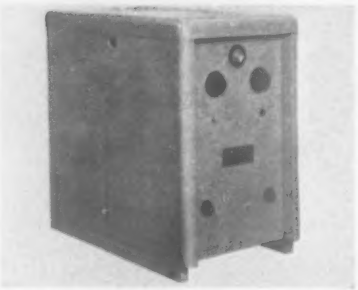
Yes, convert from overtank type to floor furnace in a matter of seconds with this GENCO.

WINDPROOF ECONOMICAL SAFE — CLEAN FOR EVERY MELTING JOB

Used by plumbers, pipe fitters, electricians, roofers, tinsmiths, mechanics. Compact. Lightweight. Easily assembled. Burns 15 hours on 5 gallons of L.P. Gas.

General Propane Gas Corp.

189 Third Street, Mineola, N. Y.



D-C Welder

266 AUTOMATIC maintenance of the desired pre-set arc voltage is claimed for the new Glenn d-c power source for all types of automatic welding. It is said to keep the voltage constant despite fluctuations in arc length. High efficiency, high power factor and utmost simplicity of installation, operation and maintenance are other features of the new welder.

Two models, 500 amp and 1,000 amp continuous-duty rated machines are available for submerged arc, inert-gas and manually-operated automatic welding. They operate on either 240 or 480 volts, three phase, 60-cycle a-c. Input requirements are only 25 amp at 480-volt for the 500 amp model operated at rated load.

Operation consists of setting the desired pre-set arc voltage, and setting the current-calibrated dial of the rod feed motor to the desired current. Practically all existing automatic welding leads can readily be modified and equipped with the current-calibrated feed control used with these power sources.

GLENN CO., 3134 E. 10th St., Oakland 1, Calif.

* * *

Plumber's Furnace

267 MODEL UF-1 plumber's furnace has two ports to accept two soldering irons. "Genco" furnaces are windproof and will not blow out on windy jobs. Fuel consumption is 5 gal. of 1-p gas in 15 hours. It has a tilt handle for safe handling and will not spill or spray fuel on the floor. Convenient operating pressure is 10 psi. Model UF-2, a high-performance furnace, uses a high-pressure regulator and ¼-in. Neoprene hose on the 1-p gas cylinder. It operates over a wide pressure range and has a needle valve control. By using a Y connection this furnace can be used with a torch, to heat two soldering irons and to melt lead all at once.

GENERAL PROPANE GAS CORP., 189 Third St., Mineola, N.Y.

W-AL-CO RODS

for Welding of ALUMINUM

ELECTRIC AND GAS WELDING

Drawn Wire

TYPES 25, 43 and 52

Brazing 718

Aluminum Solder

White Metal

Welding Alloys Manufacturing Co.

744 Broad St. Newark 2, N. J.

SPECIAL GLOVE DEVELOPMENT BY

RACINE

THREE STYLES

- 380 Horsehide
- 384 Pearl Carpincho (wildpig)
- 386 Cowhide

Chrome tanned Heat Resistant Split Leather—Heat Breaker Back Lining—LARGE size—

1 One piece back.
2 One piece palm.
3 Thumb seam protected by wide leather strap.
4 All vulnerable seams welted.
5 Palm side of thumb is protected by extra leather overlay.

• Send for booklet on these and other GARDSMEN Protective Equipment.

RACINE GLOVE COMPANY, INC.

RIO, WISCONSIN

VERN ETSCHEID has been named western district manager of THE WELDING ENGINEER, with headquarters at 520 N. Michigan, Chicago. He replaces THOMAS H. BARRY, who has left the company to work for Chilton Co., Inc. Mr. Etscheid is a graduate of Stout Institute, Menominee, Wis. and has done post-graduate work at the University of Minnesota. Before the war he was in charge of trade training in the Hammond, Ind., public school system. During the war he was with the War Department in an overseas liaison post with the rank of lieutenant-colonel. He supervised shipment and storage of engineering supplies to and from ports of debarkation and various Army depots. After the war he was co-ordinator of industrial and trade education for the city of St. Paul, Minn. and also represented Acorn Refining Co. in the Twin Cities area. In 1949 he went to work for the field circulation department of The McGraw-Hill Publishing Co. No stranger to the welding arc or torch, Mr. Etscheid once worked as a weldor at a plant in Hammond, Ind. He also taught a course in the fundamentals of welding for the Duluth public school systems.

* * *

The following promotions and additions have been announced in its field sales organization by the American Wheelabrator & Equipment Corp., Mishawaka, Ind.: K. E. BLESSING has been appointed district manager of the sales office at Hoboken, N.J. F. JOHN PICHARD has been added to that office as sales engineer, to work with David Logan and A. J. Smith. GEORGE F. BURDITT has been appointed district manager of the Pittsburgh office. C. E. Andrews is also at Pittsburgh. GEORGE C. TOLTON has been appointed district manager at the Greensboro, N.C. office. Mr. Tolton was formerly in the Seattle office for more than six years.

Salvage Tons of Castings Daily

Fill in Porosity *and* Blow Holes

with DOT-WELDING

Read What Users Say About DOT-WELDING

". . . 8,000 lbs. of castings salvaged per day by Dot-Welding."
Plumbing and Heating Mfr.

"We salvage 75,000 lbs. of grey iron castings from 200 lbs. of welding rod by Dot-Weld Process."
Stove and Castings Mfr.

"We are saving about 75 automobile engine blocks per month as a result of using your equipment."
Engine Rebuilder

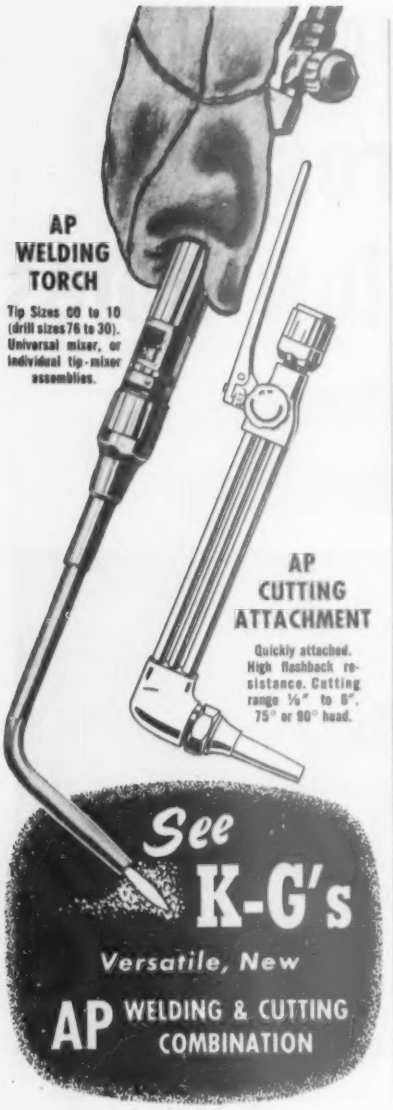
". . . 10 to 15 tons of castings reclaimed every 24 hours . . ."
Farm Tractor Company

No foundry or shop can afford to be without Dot-Weld Equipment. This exclusive cold-weld process assures effective, speedy, low-cost repair of defective castings. Also in wide use for press fit work and engine block and head repair—as well as pattern work where metal can be added to worn core boxes.

Low-temperature Dot-Weld deposited metal eliminates possibility of heat distortion and residual stresses. Deposited metal leaves no hard spots on castings. Proved time and money saver. Get the facts today.

Learn about this all-important method for casting salvage. Write for full information on the Dot-Weld Process and equipment today.

Dept. WE
METALLIZING COMPANY
of America
3520 West Carroll Avenue
Chicago 24, Illinois



ALL PURPOSE. Takes a wide variety of tips. Excellent for brazing, welding, heating, cutting. Rugged, efficient, dependable.

ASK YOUR LOCAL K-G DISTRIBUTOR!*

*In Principal Cities

Also M38 Cutting Torches, Pressure Regulators, Complete Outfits, Cutting Machines, Accessories

Catalog on Request

The K-G Equipment Company (Inc.)

Unit of Air Products, Inc.

Dept. A, Box 538, Allentown, Pa.

A. C. BROWN, JR., has been appointed general sales manager of the Air Reduction Sales Co. He was formerly regional manager in Pittsburgh, but will now have his headquarters at the New York office. He joined Air Reduction in 1935 and served in various capacities including salesman and branch manager at Grand Rapids, Mich. and district manager at Cleveland. In 1950 he took over the Pittsburgh regional post. He is a graduate of Yale and a member of a prominent Cleveland family. J. H. KEENEY succeeds Mr. Brown as regional manager at Pittsburgh. J. H. HART, Detroit district manager succeeds Mr. Keeney as administrative assistant at Pittsburgh. R. A. JAMIESON takes over as manager at Detroit.

* * *

ALEXANDER GOBUS will head the newly established Non-Destructive Testing Dept., of North American Philips Co., Inc., Mt. Vernon, N.Y. He was vice-president, chief metallurgist and director of non-destructive testing, Sam Tour & Co., Inc., from 1943 to 1953. Mr. Gobus is the American Welding Society representative to the American Standards Association group charged with modernized the present code for X-ray protection. He is also the ASTM representative to the committee on standard radiographs of the International Institute of Welding. He holds memberships in many technical societies and on many committees for improving industrial radiography techniques.

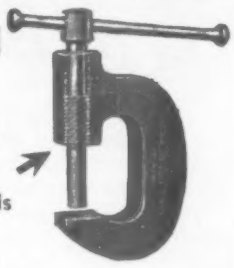
* * *

DONALD W. TAIT has been appointed manager of sales promotion of the equipment sales division of Raytheon Mfg. Co. His experience includes promotion work for Chase Brass and Copper Co. and Great Lakes Carbon Corp.

* * *

DR. BRIAN O'BRIEN has been appointed vice president in charge of research of American Optical Co., Southbridge, Mass. He has taken a leave of absence as director of the Institute of Optics and as research professor of physics and optics at the University of Rochester, with which he has been affiliated since 1930. He is president of the Optical Society of America, which in 1951 awarded him the Frederic Ives Medal for distinguished work in optics.

"Red Head"
WELDING CLAMPS



Designed for Welding

No Threads To Damage

1. Case hardened threads are always protected from weld spatter and never exposed to damage in open or closed position.

2. The clamp body is cut from solid plate, thereby insuring extreme rigidity and giving great resistance to bending or twisting.

3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

23 stock sizes

CHICAGO BOILER COMPANY
1969 CLYBOURN AVENUE
CHICAGO 14, ILLINOIS

HOLDENFLUX

new type paste flux

FOR SILVER BRAZING COPPER, BRASS, BRONZE, STAINLESS, AND OTHER FERROUS AND NON-FERROUS METALS

Always Uniform. Never Cakes. No Mixing. Contains a new additive that speeds brazing. Approved under Navy specification 51F4a.

Sold and billed through welding supply distributors. Or you may order direct, advising name of supplier.

Two Shipping Points: New Haven and Detroit

The STANDARD SUPPLY COMPANY
460 WE Grand Ave., New Haven, Conn.

CHARLES W. NIEDERAUER has been named general manager of the Thermacote Co., Newark, N.J., manufacturers of torch tip cleaners, lighters, plastic-coated lens and other welding items. He recently resigned as vice-president of The Borden Co., chemical division. He will devote much of his time to the development of new products.

* * *

ALEXANDER MCKENZIE has been named district sales manager for parts of Ohio, Pennsylvania and West Virginia for Miller Electric Mfg. Co., Appleton, Wis. He has had many years of experience in welding and sales work. In 1924 he began work with Consolidated Aircraft, Buffalo. N.Y. in its welding department and studied welding and electrical courses on the side. In 1936 he went with Linde Air Products Co. and covered the Philadelphia, Baltimore and Charleston area. During that time he made several contributions to the improvement of inert-gas and submerged-arc welding techniques. He was born in Glasgow, Scotland.

* * *

WALTER GOERG has been assigned to handle publicity for the Air Reduction Sales Co., New York City. He replaces CHARLES MCCLEAN who has been transferred to other duties in the company.

* * *

JOHN R. FREEMAN, JR., has been appointed vice-president of metallurgy and research of The American Brass Co. He is a 1916 graduate of MIT, and a veteran of 23 years with American Brass. He worked for the National Bureau of Standards for 15 years prior to 1930.

* * *

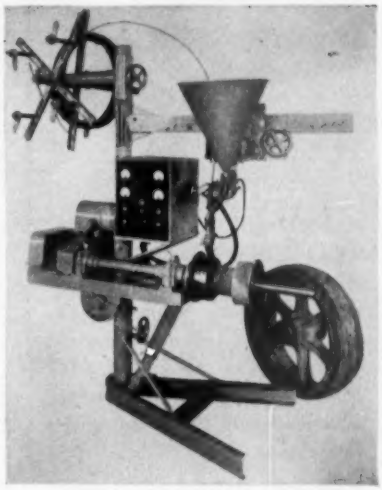
JOHN S. GATES has been elected treasurer of Foote Mineral Co., Philadelphia, succeeding Gordon H. Chambers, who continues as president.

* * *

Died . . .

HAROLD S. ZEIGLER, 51, president of Tank-Tainer Corp., Gary, Ind., died Feb. 22 after a five months' illness. He and William H. Bass formed the Tank-Tainer Co. in 1949 in East Chicago, Ind., from where they moved in 1950. For some years he was with National Cylinder Gas Co. as a salesman in the Chicago area. He was a member of the Gary Chamber of Commerce.

WELDING THAT IS *Really Automatic*



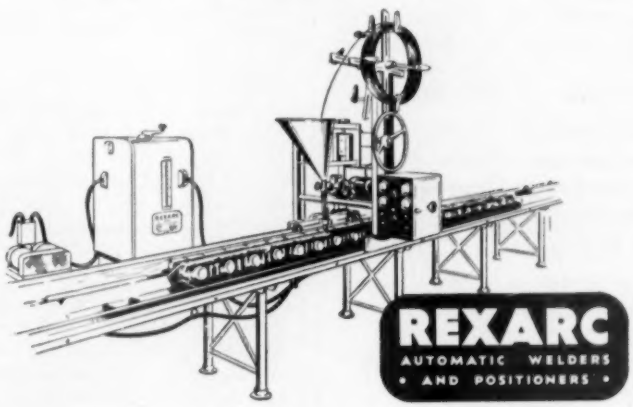
Rebuilding rollers, idlers, crusher rolls and countless other circular shapes is fast and simple—with a Rexarc Automatic Welder and Positioner.

Here's welding that is *really* automatic! Metal is deposited at a fast rate with complete control over low arc voltage and amperage, minimizing stress and dilution of the parent metal. High frequency starting and stabilization assures a steady arc. Welding can be lineal or cross-bead, continuous or in sequence.

Rexarc Welders can be equipped for automatic step-over and spiral welding and timed to operate at pre-determined speeds for any desired length of time.

REBUILDING CRAWLER TYPE TRACTOR RAILS

Welding on tractor rails and other longitudinal surfaces is accomplished easily by transferring the welding head and controls to a flat-bed positioner. On rail work, the welding arc breaks at each joint and starts automatically at the next link, depositing new metal to the desired height. Angle of the rail is automatically compensated on each succeeding pass. Metal is thus applied to the exact length and shape of the exposed link, leaving the joints free. Cutting or grinding after welding is virtually eliminated.



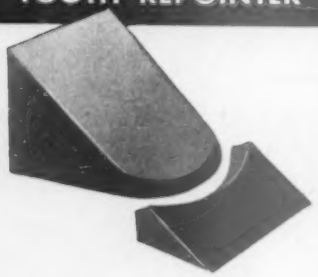
Let us send you Complete Information

THE SIGHT FEED GENERATOR COMPANY

55 EAST THIRD ST. **WEST ALEXANDRIA, OHIO, U. S. A.**

BERGSTROM CASTALOY

"Tailored To Fit TOOTH REPOINTER"



SAVE 50% LABOR AND MATERIAL COSTS with Bergstrom Castaloy shaped bucket teeth repointers. No cutting of worn teeth or repointers is necessary. Special alloy steel (44 Rockwell C) has wear-resistant hardness and shock-absorbing toughness.

OUTWEARS MANGANESE POINTS—by two or three times—by hard facing with special Bergstrom hard surfacing rods. These rods, with high chromium deposits, minimize friction, one of the major causes of wear.

LESS BREAKAGE OF REBUILT TEETH results because specially designed crescent-shaped welds eliminate stress concentrations, a major cause of breakage in rebuilt teeth.

Try These Two New Rods:

MANGALOY W—for welding manganese repointer bars, or repointers to manganese or steel bucket teeth.

H.F.M. 600—for hard facing manganese — where terrific abrasion is a problem.

Write today for descriptive literature.

INDUSTRIAL OVERLAY METALS INC.
EATON • OHIO

THE welding industry lost one of its outstanding leaders Feb. 22 when ERIC SEABLOOM, 52, first vice-president of the American Welding Society, passed away. Mr. Seabloom was supervisor of field engineering for Crane Co., Chicago, and one of the country's top authorities on welding of pressure piping and chrome alloy materials.

He was born in Sweden in 1900 and came to this country in 1909. In 1917 he joined the Crane Co. and from 1925 on was vitally interested in that company's welding activities. He was given the position of welding engineer in 1932 and soon devoted his full efforts to welding and welding research. His welding interests extended outside of the company in his active promotion of welding processes in the many technical societies to which he contributed his time and energy over the years. Mr. Seabloom was a past chairman of the Chicago section of AWS and a past director-at-large. He would have been AWS president next year. He contributed much work and knowledge to many AWS committees. His wife, Florence N. Seabloom, and his mother and two sisters survive him.

* * *

EMMET BRYANT, 63, vice-president of Contour Marker Corp. of California, Compton, Calif., died Feb. 8. He was born in Georgia in 1889. His connection with the company started in June, 1946. All production and shipping for the firm was directed by him. His son, K. D. Bryant, is president of Contour Marker Corp.

* * *

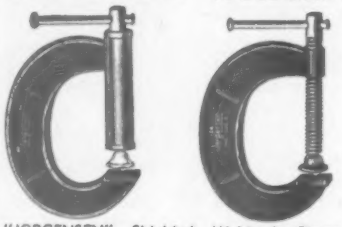
FRANK H. GORDON, 74, retired vice-president of Lukens Steel Co., died Feb. 10 at Coatesville, Pa. He has been retired since June, 1948, when he had finished 53 years with the firm. His first job was as office boy, just after his graduation from high school in 1895.

* * *

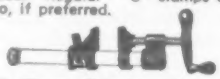
HENRY O. WIESE, 76, consulting engineer for Wiese Plow Welding Co., Inc., Perry, Ia., died Dec. 2. One of the pioneers of the welding industry, he commenced blacksmithing in 1893. In 1934 he formed the Wiese Plow Welding Co. with his son, Lee. The elder Mr. Wiese retired in 1946 except for consulting duties. He is survived by his son and by four brothers and four sisters.

"Jorgensen" and "Pony" U.S. PAT. OFF.

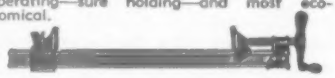
CLAMPS for WELDERS:



"JORGENSEN" Shielded Welders' Clamps eliminate damage from "spatter", and are low-priced. "Regular" "C" clamps are available too, if preferred.



"PONY" Clamp Fixtures make ideal bar clamps on any length of black pipe. Fast operating—sure holding—and most economical.



"JORGENSEN" Steel Bar Clamps are designed for the severe requirements of welding service; exclusive "multiple disc clutch" makes for instant adjustment—economy. The trade-mark "JORGENSEN" or "PONY" on your clamps is assurance of utmost satisfaction in service—specify and insist upon them from your supplier. FREE CATALOG ON REQUEST.

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"The Clamp Folks"
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FOR MACHINEABLE WELDS

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Machines at fusion lines and in the weld! Reduces pre-heating to only 300° F. Weld hardness: 15-20 Rockwell C. For A.C. or D.C. welding machines—reverse polarity.

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"Flux-Well" Welding Fluxes
Sold Thru Leading Distributors
THE CHICAGO HARDWARE FOUNDRY CO.
"Dependable Since 1897"
NORTH CHICAGO, ILLINOIS

30 YEARS AGO

(Taken From THE WELDING ENGINEER of April, 1923)

HOSPITAL use of an oxygen-acetylene mixture as an anesthetic has been reported in the newspapers. The ratio used was 60% oxygen to 40% acetylene. Heretofore the editor's only knowledge of oxyacetylene mixtures in surgery was with regard to the repair of artificial limbs.

—30 YEARS AGO—

THE new medium of radio was recently used to tell Minnesota listeners about the advantages of oxyacetylene welding and cutting. E. H. Smith, president of Smith's Inventions, Inc., Minneapolis, gave an entertaining 15-minute talk March 26 on that city's station WLAG. Included were several pretty good jokes. One was a neat solution to the old gag about welding icicles—just use a few drops of liquid oxygen, he advised. Another concerned an over-confident "confidence" man who thought he could make a million dollars just in Minnesota cutting off pine tree stumps with the oxyacetylene torch.

More seriously, Mr. Smith described the large number of manufactured products that are welded today, as well as some instances of spectacular repairs accomplished. Last fall, in 1922, one farmer saved two days' stand-by pay for a 17-man threshing crew he had hired to harvest his wheat. At 10 a.m. one day a sudden leak in the boiler shut down the threshing machine they were using. Thinking he had a two-day wait for repairs on his hands, the farmer went to town to look up a blacksmith. Luckily, the one he found knew about gas welding and brought his portable welding rig right out to the wheat field. He welded up the crack in the boiler in just two hours and harvesting was resumed.

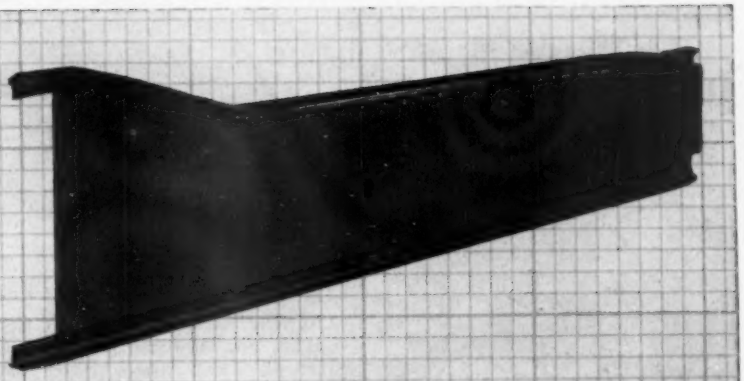
Mr. Smith's closing remarks were advice to his listeners suggesting they give welding a try when their autos, their farm machinery or their household fixtures needed repairing.

—30 YEARS AGO—

WELDED repair of 8-ton cast iron smelter pots is the theme of the Oxweld Acetylene Co. ad this month. Gas welding was utilized to repair large breaks in 26 of the pots, in use at a big mining company out West.

—30 YEARS AGO—

ARC welding of cast iron is discussed in a fine article this month by W. H. Namack of the northern New York section of AWS.

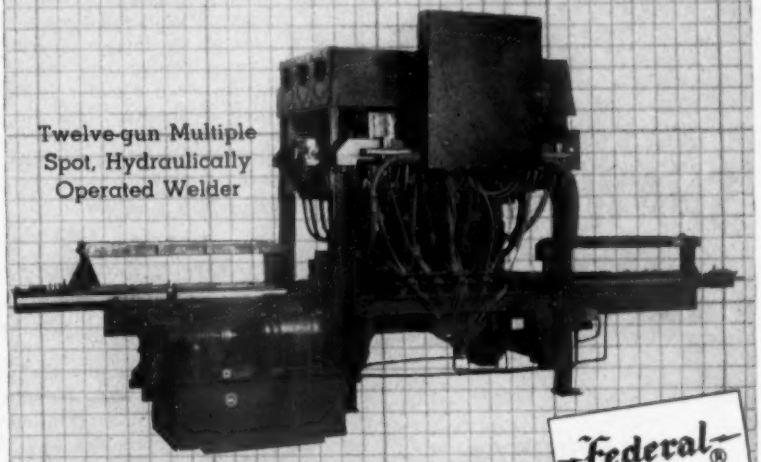


15,000 WELDS per HOUR

FEDERAL WELDER INCREASES PRODUCTION, CUTS COSTS ON NEW DESIGN AUTOMOTIVE FRAME CROSS MEMBER . .

It's happened again! A leading manufacturer has redesigned a product to receive the benefits of resistance welding. An automotive frame builder redesigned the cross members and asked Federal to build a machine that would weld the sections together.

Federal engineers designed and built two twelve-gun multiple spot, hydraulically operated welders that delivered 190 finished pieces per hour, doubling production and cutting costs by more than 25 percent. The welders are compact, releasing valuable floor space, with open framework that provides easy maintenance. The six 150 KVA transformers are arranged for three-phase distribution to equalize power demands. Equipped with shuttle type fixtures, the machines are constantly working . . . no down time while loading. These and many other features are reasons why this fabricator, like hundreds of others, has turned to resistance welding and Federal Welders for high speed, low cost and uniform quality production.



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Federal® WELDERS

THE FEDERAL MACHINE & WELDER COMPANY

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Warco PRESSES®

Dice Microhm Meter Aids Welding Quality Control

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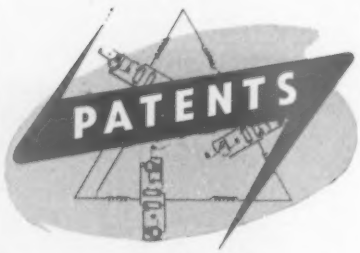
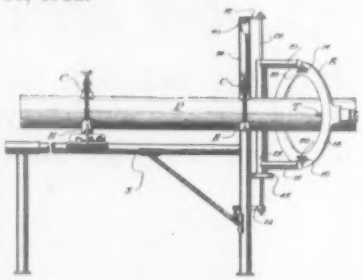


Fixture for Flame-Cutting Pipe

2,623,742. EVERETT G. LIVESAY, Coral Gables, Fla. Assigned to Livesay Industries, Inc., Miami Beach, Fla. Filed Jan. 27, 1949. Granted Dec. 30, 1952.



A newly patented device for flame-cutting pipe includes a stand and a pipe clamp for holding a pipe length in a horizontal position. A cutting torch is supported by the stand so that it can operate on the pipe. There is a torch supporting ring. Trunnions carried by the stand support the ring in a number of angularly adjusted positions. The trunnions are fixed to a hinge pintle carried by the stand to occupy a vertical axis at one side of the position of the pipe to be acted upon. The ring comprises a base ring fixed against rotation and a rotatable ring carried by the former. Bearings support the rotatable ring on the fixed one. An electric motor is supported solely by the fixed ring. Gearing between the motor and the rotatable ring drives the latter. Means are provided for adjustably supporting a torch on the movable ring.

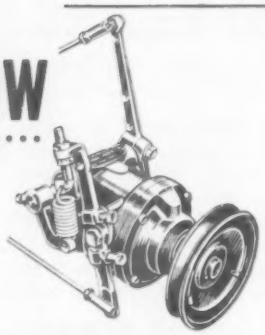
* * *

Pipe-Cutting Fixture

2,623,285. SAM G. MARINOVICH. Los Angeles. Filed Dec. 1, 1951. Granted Dec. 30, 1952.

This patent refers to a pipe-cutting machine having a spindle mounted for both endwise and rotational movement. It also mounts a tool. A generally circular templet has its center on the axis of the spindle. An adjustable mount for the templet embodies two concentric rings adjustable on axes that are at right angles to each other and in a plane transverse to the spindle axis. An adjustable tracer is carried by the spindle.

NOW



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A practical form of periscope improved in mechanical design to make it adaptable for electric welding.

Offers a means of getting into offset or close places where you cannot normally see to make the necessary weld. Saves time and money on many production and plant maintenance jobs.

WRITE FOR BULLETIN A-1000

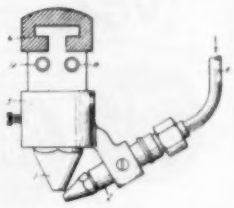
IPCO Safety Equipment for all Industries

INDUSTRIAL PRODUCTS COMPANY

2802 N. Fourth St., Philadelphia 33, Pa.

Offset Cutting-Oxygen Tip

2,623,576. PETRUS W. M. M. DE JONG, HENDRIK G. VAN HUIS and JACOB RIDDERIKHOFF, Delft, Netherlands. Assigned to Shell Development Co., San Francisco. Filed Jan. 24, 1949. Granted Dec. 30, 1952.



A newly patented cutting torch was developed to make oblique cuts in metallic bodies. The preheating tip has a discharge orifice for directing a jet of fuel gas mixture against the metal surface. A cutting tip is supportedly connected to the preheating tip. Its orifice directs an isolated jet of cutting oxygen against the metal in the immediate vicinity of the preheating jet. The cutting oxygen stream is inclined at an angle of more than 30 deg to the axis of the preheating stream. It is also offset from the latter in a direction perpendicular to a plane through the isolated jet that is parallel to the preheating stream.

MAN! TRY JOHNSON'S NEW BRAZING FLUX... IT REALLY TRAVELS... DOESN'T BURN OUT!

Try JOHNSON'S NEW ALL-PURPOSE BRAZING FLUX on the toughest job in your shop. Find out for yourself that here's a flux that really travels . . . lets you work metal all around . . . thoroughly cleans metal . . . and yet, JUST DOESN'T BURN OUT! For better brazing of steel, cast iron, malleable iron, bronze, copper and copper alloys, use JOHNSON'S NEW ALL-PURPOSE BRAZING FLUX.

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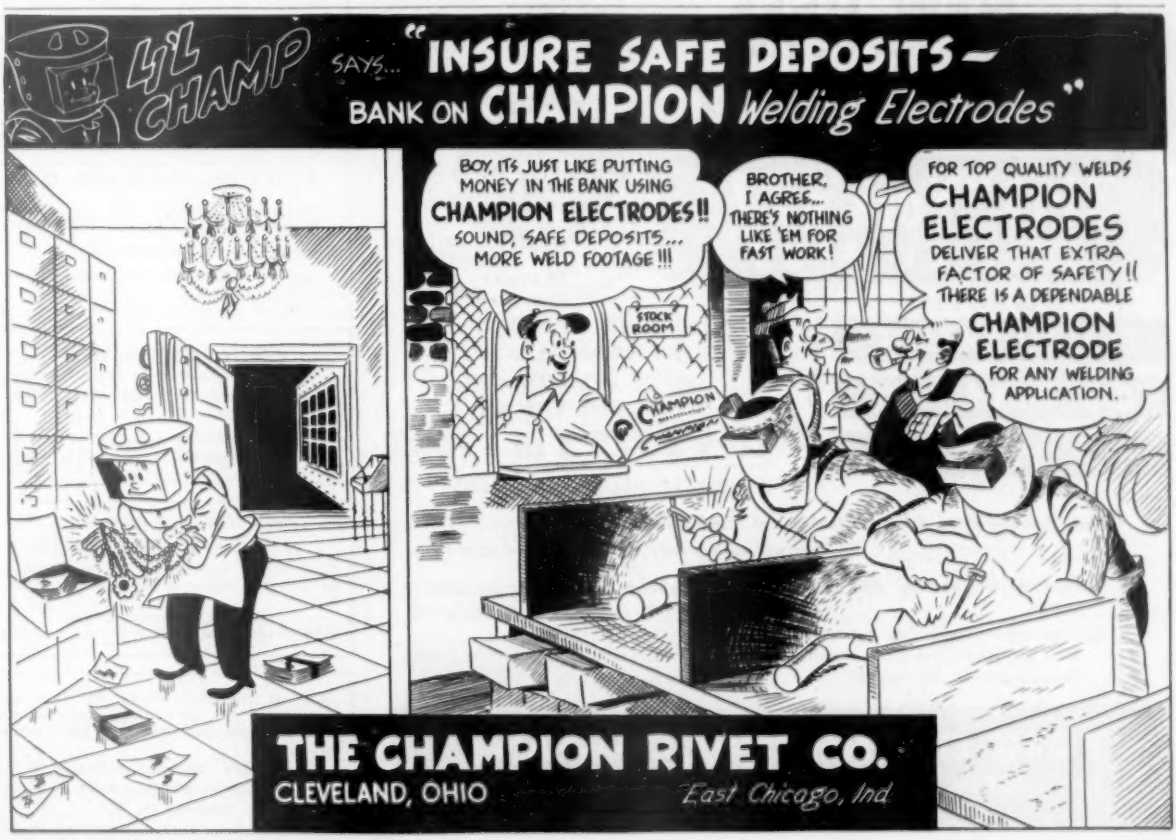
LIL CHAMP
SAYS... "INSURE SAFE DEPOSITS — BANK ON CHAMPION Welding Electrodes"
BOY, ITS JUST LIKE PUTTING MONEY IN THE BANK USING CHAMPION ELECTRODES!! SOUND, SAFE DEPOSITS... MORE WELD FOOTAGE !!!
BROTHER, I AGREE... THERE'S NOTHING LIKE 'EM FOR FAST WORK!
FOR TOP QUALITY WELDS CHAMPION ELECTRODES DELIVER THAT EXTRA FACTOR OF SAFETY!! THERE IS A DEPENDABLE CHAMPION ELECTRODE FOR ANY WELDING APPLICATION.
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CHAMPION
THE CHAMPION RIVET CO.
CLEVELAND, OHIO
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Another engineering achievement . . . the NEW Model VG4D V-type 4-cylinder Wisconsin Heavy-Duty Air-Cooled Engine, increasing the power range to 36 hp. — a power gain of more than 16% over the VP4D, former top engine in the line.

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The Model VG4D engine is definitely Tops in Performance, delivering a maximum of power per pound of engine weight, at minimum operating and maintenance costs.
We invite your request for complete detailed specifications.

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SAVE MONEY
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- CAST IRON BRAZING
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1/8"	Alloyrod Armorarc	19-9	32,245
1/8"	Surewald Armo	19-9	2,700
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PERFECT CONDITION
500 lbs. minimum orders
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Transformer & Generators, 50 used & new gas welding & cutting outfits, single torches, tips, twin hose parts for all makes—expert repair.

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M. C. SOLON
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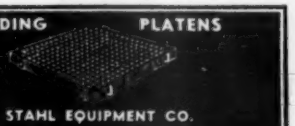

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20 — 300 Amp. MG
220/440 welders

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Oxygen—Acetylene plants—Cylinder—Welding Machines, etc. Will buy or sell your surplus items.

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When the job says

WELD IT!

be ready with

MARQUETTE

Marquette is the welding equipment used by more and more shops and companies for both maintenance and production welding. Precision-engineered, compact, mobile, Marquette welders are recognized for their outstanding performance under difficult conditions. The Marquette line of electrodes and rods is justly famous for offering not only the right rod but the best rod for each kind of welding job. When the job says "Weld it"... be ready with Marquette!

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A

Adjustable Clamp Co. 102
Air Reduction Sales Company 10-11
Allen Co., L. B. 107
Alloy Rods Company 22
All-State Welding Alloys Co., Inc. 87
American Brass Co., The 71
American Chain & Cable Co., Inc. 81
American Manganese Steel Division 77
American Platinum Works, The 21
Ampco Metal, Inc. 75, 82
Archer, Inc., Fred C. 25

B

Becker Bros. Carbon Co. 88
Bonney Forge & Tool Works 23

C

Cam-Lok Div. of Empire Products, Inc. 82
Carborundum Company, The 31
Champion Rivet Company 105
Chicago Boiler Company 100
Chicago Hardware Foundry Co., The 102
Cincinnati Tool Company 104
Crucible Steel Co. of America 9

D

Dice Company, J. W. 104
Diversey Corporation, The 94
Dockson Corporation 86, 87
Drawalloy Corporation 35

E

Erico Products, Inc. 90
Eutectic Welding Alloys Corp. 83

F

Federal Machine & Welder Co. 103

G

General Electric Company 14-15, 61
General Propane Gas Corp. 98
Goldsmith Bros. Smelting & Refining Co. 95
Grand Specialties Co. 96

H

Handy & Harman 72
Harnischfeger Corp. 78, 79, 97
Harris Calorific Co., The 26
Hewitt-Robins, Inc. 65
Hobart Bros. Co. 1

I

Independent Eng. Co., Inc. 80
Industrial Overlay Metals, Inc. 102
Industrial Products Company 105
International Nickel Co., Inc. 16

J

Jackson Products ..... Inside Front Cover
Johnson Mfg. Co., Inc. 105

K

K-G Equipment Co. (Inc.) 100
Krembs & Company 92

L

Lindberg Engineering Company 12
Lincoln Electric Co., The 36
Linde Air Products Co., A Div. of Union Carbide & Carbon Corp. 66
Liquid Carbonic Corp., The 93

M

Mallory & Co., Inc., P. R. 4
Marquette Mfg. Co., Inc. 108
Metal Bond Mfg. Co. 98
Metal & Thermit Corp. 38
Metallizing Co. of America 99
Miller Electric Mfg. Co. 28
Mullenbach Elec. Mfg. Co. 94

N

National Carbide Corp. 84
National Cylinder Gas Co. 29
National Welding Equipment Co. 7

P

Page Steel & Wire Division 81
Pennsylvania Optical Company 17
Phoenix Products Co. 69
Pierce Governor Co., Inc., The 104

R

Racine Glove Co., Inc. 98
Reed Engineering Co. 86
Reid-Avery Co., The 73
Robotron Corporation 32

S

Sellstrom Mfg. Company 75
Shawinigan Products Corp. 104
Sight Feed Generator Co. 101
Smith Corp., A. O. ..... Back Cover
Smith & Sons Co., G. W. 88
Smith Welding Equipment Co. 89
Standard Supply Co. 100
Steel Sales Corp. 92
Stoody Company 27
Stulz-Sickles Co. 84
Sylvania Electric Products 20

T

Tempil Corp. 96
Tube Turns, Inc. ..... Binds between pages 34-35
Tweco Products Co. ..... Inside Front Cover

U

Union Carbide & Carbon Corp., Linde Air Products Co. 66
U. S. Safety Service Co. 85
U. S. Steel Co. 30
U. S. Steel Supply 30

V

Victor Equipment Co. 13, 68

W

Wall Colmonoy Corp. 91
Welding Alloys Mfg. Co. 98
Welding Fittings Corp. 2
Westinghouse Electric Co. 8
Wisconsin Motor Corp. 106

Y

York Engineering Company 106

Z

Zirconium Metals Corp. of America ... 24

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 106
Selling Opportunities Offered 106
Position Wanted 107

BUSINESS OPPORTUNITIES
Offered 107

EQUIPMENT
(Used or Surplus New)
For sale 107

WANTED
Equipment 107

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	318
SW-159	310
SW-160	316
SW-161	317
SW-162	308
SW-166	309
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